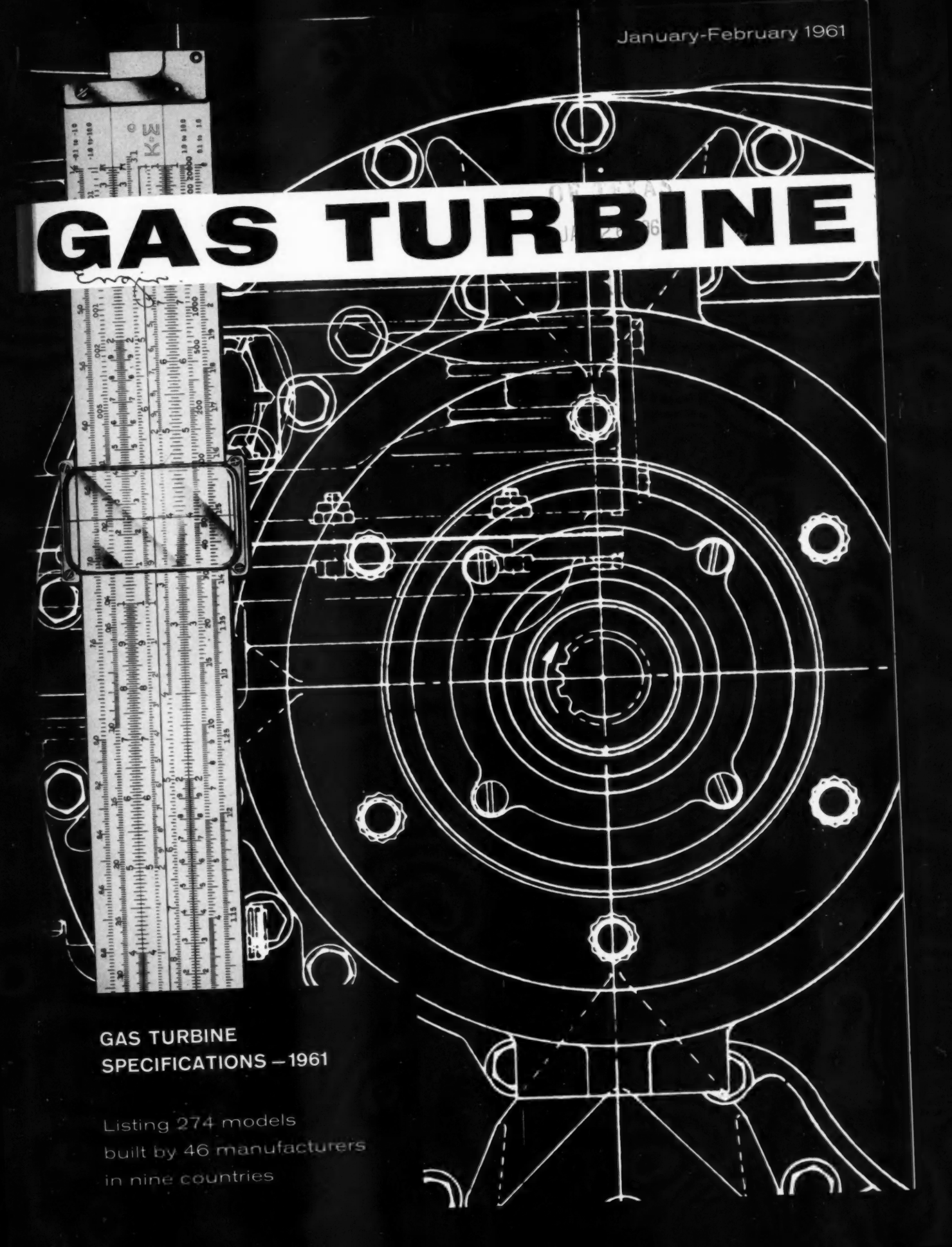
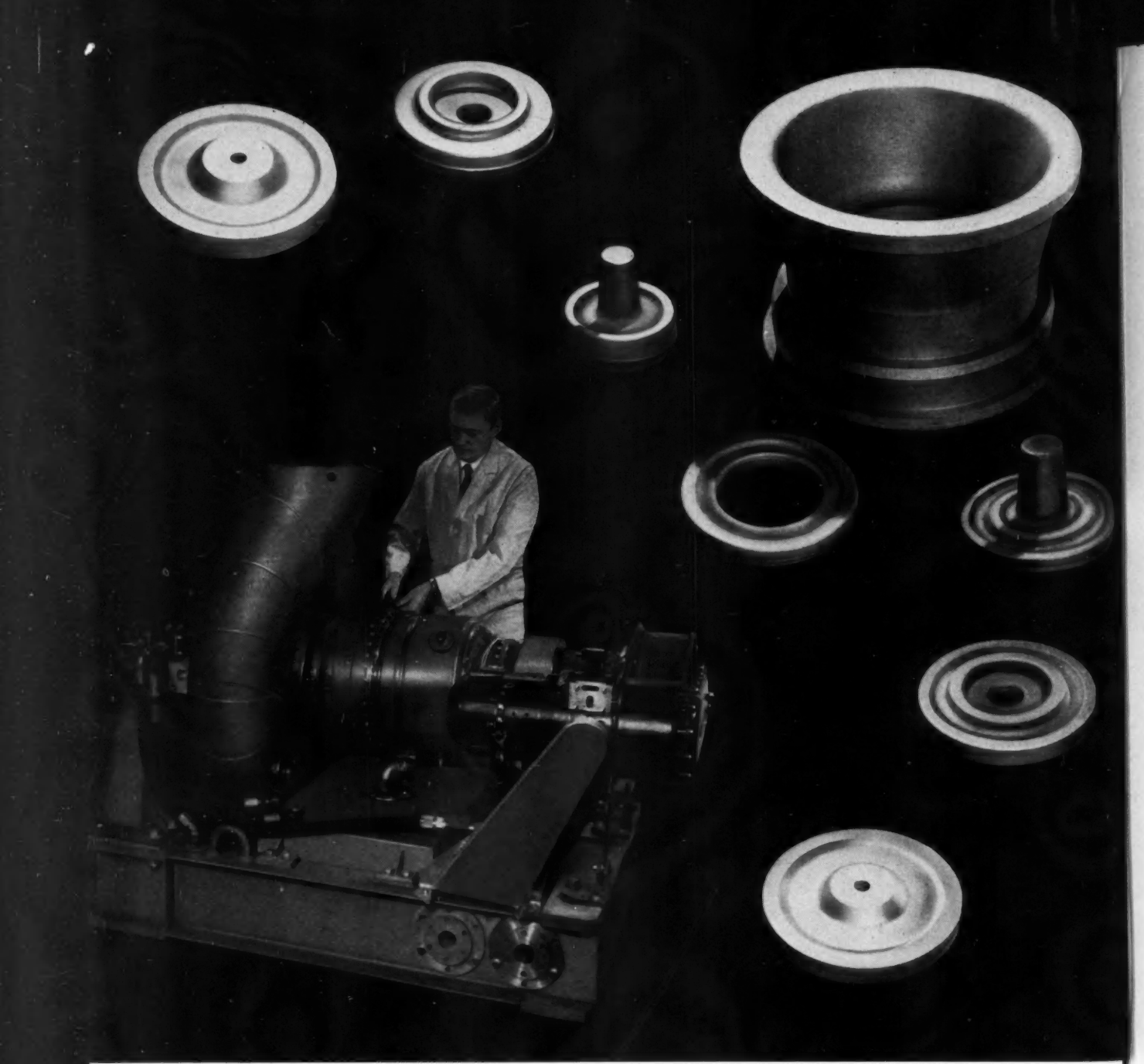
January-February 1961

GAS TURBINE



GAS TURBINE SPECIFICATIONS – 1961

Listing 274 models
built by 46 manufacturers
in nine countries



CAMERON FORGINGS IN THE SOLAR SATURN* ENGINE

Solar Aircraft Company's 1,100 H.P. Saturn Industrial Gas Turbine Engine weighs about 1,000 pounds—its unusually efficient performance is setting new standards in new applications for the up and coming gas turbines. Increased reliability and versatility in gas turbines required something new in forging performance. That's why Solar called on Cameron for all the rotating forgings in the Saturn.

Both pure jet and turbo jet forged components from Cameron had already hit a new high in forming and metallurgical refinement. Properties at elevated temperatures consistently exceeded specifications, often as much as 20%. The Cameron forged Saturn engine components attest once more to the high quality and favorable properties which have become a specialty with us. Cameron perfected processes have no exact counterpart in forging history. Ten years of steady success have supplied us with a wealth of case histories and technical refinement. If you design, specify, or purchase ferrous forgings for demanding service (exotic metals, extreme temperature, etc.), in conventional or unusual shapes, from a few pounds to 13,000 pounds in weight—just write, call or come by.

*A Registered Trademark of Solar Aircraft Company

Cameron
IRON WORKS, INC.
SPECIAL PRODUCTS DIVISION
P. O. Box 1212, Houston 1, Texas

For more information write in No. 180

Union Pacific's new and mighty locomotive crests Sherman Hill, Wyoming, with a heavy load.

WORLD'S MOST POWERFUL LOCOMOTIVE SPEEDS FREIGHT ECONOMICALLY WITH BENDIX FUEL AND IGNITION SYSTEMS

This is the world's mightiest self-powered locomotive at work. On level track, it can pull 735 fully loaded freight cars—a train more than seven miles long! Its two engines—an auxiliary diesel engine and a gas-turbine power plant—depend on Bendix fuel injection and ignition systems to help keep its mighty power flowing smoothly and efficiently.

This new gas turbine-electric locomotive, built by General Electric for Union Pacific, is designed to haul freight faster and more economically. It burns less expensive "residual" fuel—a thick, viscous substance with a heavy tar content which must be heated before it will flow freely.

The Bendix ignition system fires this low-volatile fuel as efficiently as volatile gasoline is ignited in your automobile engine. The Bendix fuel injection system is used in the auxiliary diesel engine, which also furnishes power for "yard" movement of the locomotive.

General Electric has been an important builder of locomotives for more than 65 years. To be selected as the supplier of fuel injection and ignition equipment by G.E. for the mightiest locomotive they have ever built, is truly one of the finest tributes that could be paid to the all around efficiency of Bendix equipment.

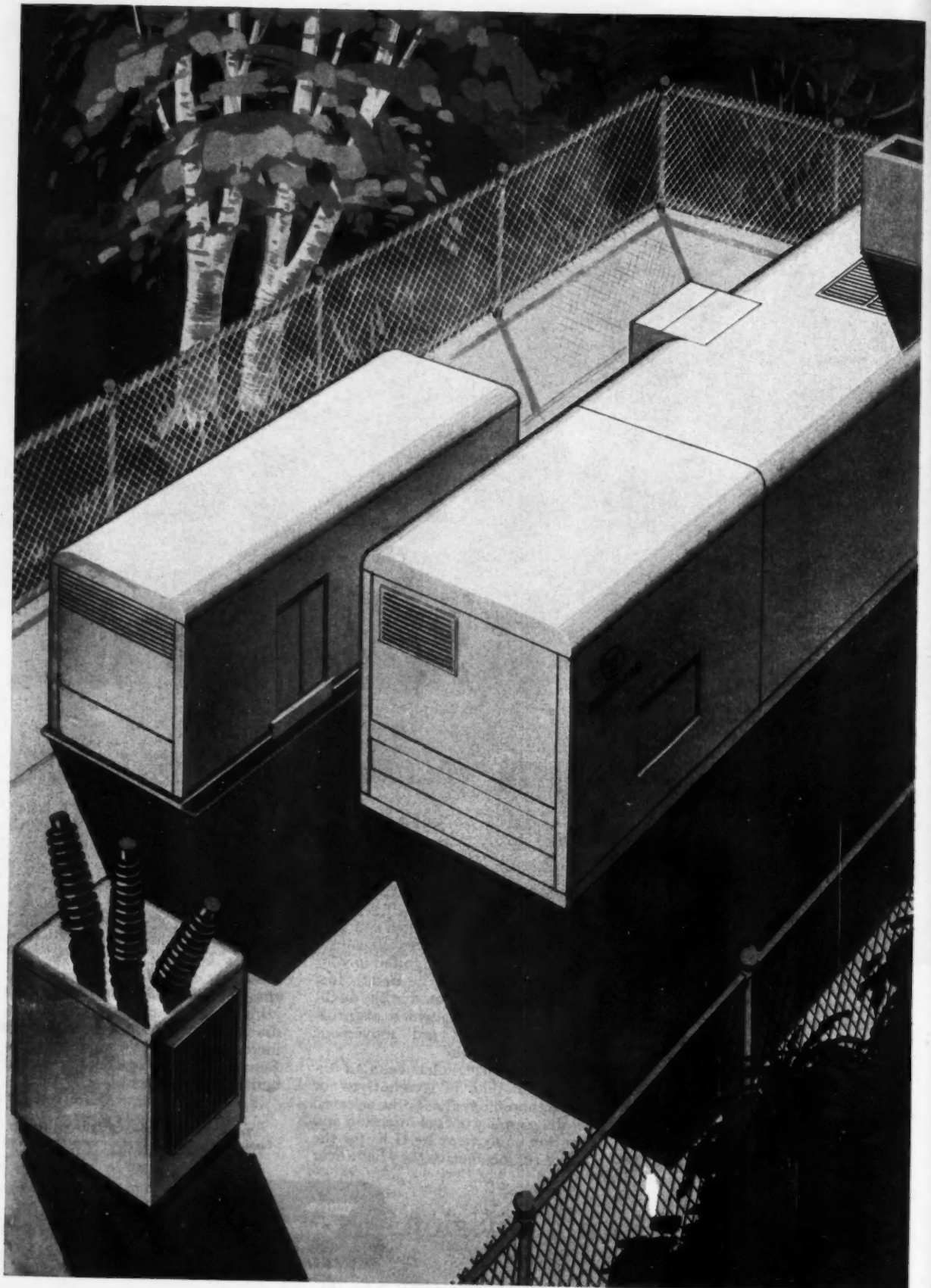
It is equally impressive that whenever exceptional performance, complete dependability and operating economy are the requirements, diesel engine manufacturers in increasing numbers are turning to Bendix for their fuel injection and ignition requirements.

SCINTILLA DIVISION OF
THE BENDIX CORPORATION, SIDNEY, N.Y.
Export Sales and Service, Bendix International Division
205 East 42nd Street, New York 17, N.Y.

Scintilla Division
SIDNEY, N. Y.

THE Bendix CORPORATION

For more information write in No. 181



New Westinghouse ECONO-PAC Gas Turbine

3000, 7000 or 12,000 kw a self-contained plant for peaking, reserve and emergency cuts installed costs to $80 and $100/kw

Here is another new measure of economy in power generation—the Westinghouse ECONO-PAC* gas turbine power plant. The ECONO-PAC is completely integrated when delivered, ready for immediate use.

The complete installed cost of ECONO-PAC is as low as $80/kw, based on winter operation, or $100/kw for summer operation. These costs are decidedly lower than those for conventional plants of the same or even larger sizes. And, the ECONO-PAC features portability—goes as a unit to location where needed as loads change.

The Westinghouse ECONO-PAC gives these definite advantages:

Meets wide range of generating problems . . . peaking, reserve capacity or emergency service.

Fast installation . . . only fuel, electrical connections and a flat concrete slab foundation (about three feet thick) are needed to put ECONO-PAC into operation; means two weeks or less from arrival on site to start-up.

Fully automatic . . . unattended operation.

Portable component construction . . . complete unit can be relocated quickly to meet changing system loads.

Full capacity, dual fuel operation . . . uses the most economical fuel without loss of rated output.

Dry plant operation . . . radiator coolers eliminate cooling water requirements.

Increased capability at low ambient temperature . . . at 40°F, plant output is increased by 25%.

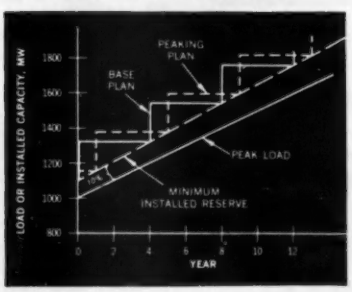
Quiet . . . acceptable in residential areas.

Call your Westinghouse representative for details on ECONO-PAC—the distinctive, low-cost power package. You can be sure . . . if it's Westinghouse.

*Trade-Mark
J-50618

Westinghouse

WESTINGHOUSE POWERCASTING STUDY REVEALS ECONOMY OF GAS TURBINE APPLICATION

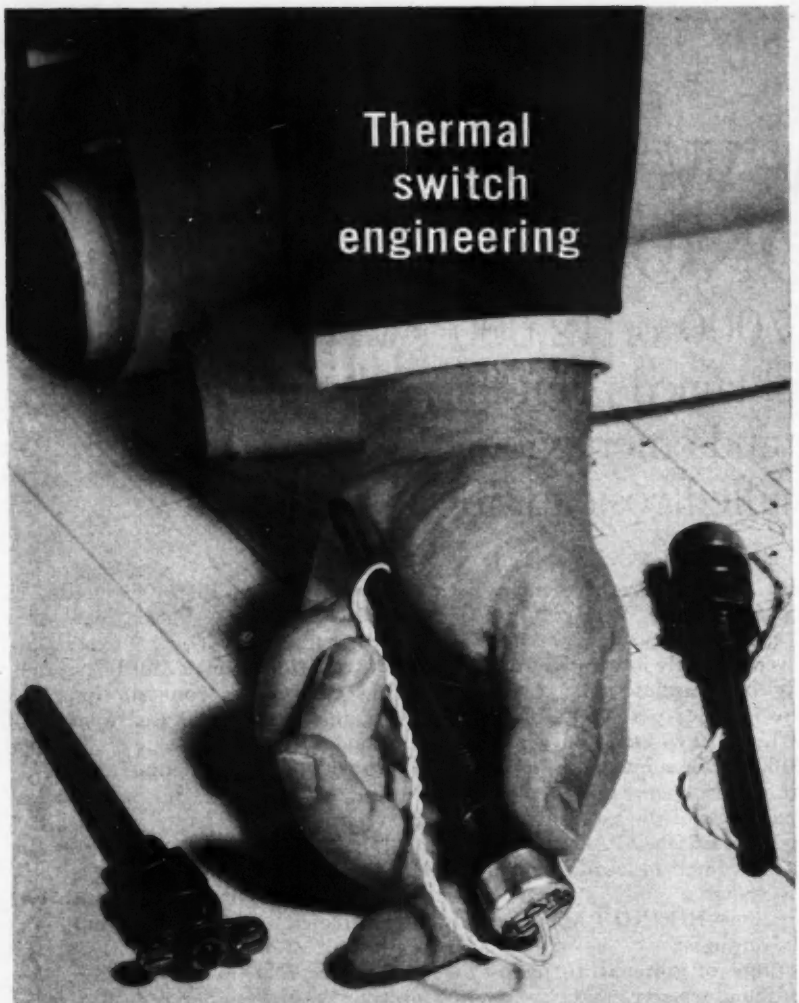


Westinghouse conducted a Powercasting study recently for a utility working on a 4-year cycle of adding generating equipment. The study showed that addition of gas turbine plants permitted postponement of buying base-load generators for a year. This would make possible a potential net capital saving of over $800,000 over a 13-year period.

COMPLETE RANGE

Westinghouse offers a complete line of gas turbine power plants—ranging from 3 to 150 mw—engineered for your particular requirements.

For more information write in No. 182



CPI R&D OFFERS A SUPER-HIGH TEMPERATURE CONTROL SWITCH WITH A CHOICE OF SEALING

Here's real thermal switch engineering! The original super-high temperature CPI thermal switch (to the left in the illustration) was environmentally sealed and performed excellently. However, the interest that it created for additional applications led to even further development. CPI research went to work and came up with a modification of the original super-high temperature switch. Now the switch is available with an internally hermetically sealed head construction, using a special ceramic seal.

This is another case story of how CPI research can help solve your thermal control problems. If you have such problems now, tell us about them.

These probe-type thermal switches can be calibrated up to 1750°F. Each can safely overshoot to 2200°F or undershoot to −100°F and both exceed standards of MIL-E-5272A. Applications include gas turbines and rocket engines.

CPI

CONTROL PRODUCTS, INC.

275 Ridgedale Avenue, East Hanover, N. J.

For more information write in No. 183

SIXTH ANNUAL

GAS TURBINE CONFERENCE and PRODUCTS SHOW

MARCH 5-9 1961

SHOREHAM HOTEL
WASHINGTON, D. C.

SPONSORED BY

GAS TURBINE POWER DIVISION ASME

CO-SPONSORED BY

DEPARTMENT OF DEFENSE

CONTACT:

J. M. CLARK, Exhibit Manager
Gas Turbine Power Division
793 Delafield Ave.,
Staten Island 10, N. Y.
PHONE: Gibraltar 2-3227

"The Defense Department specifically desires that the exhibits to be shown either at the Pentagon or at the Shoreham, be production units for industry."

GAS TURBINE

VOLUME 2, No. 1, January-February, 1961

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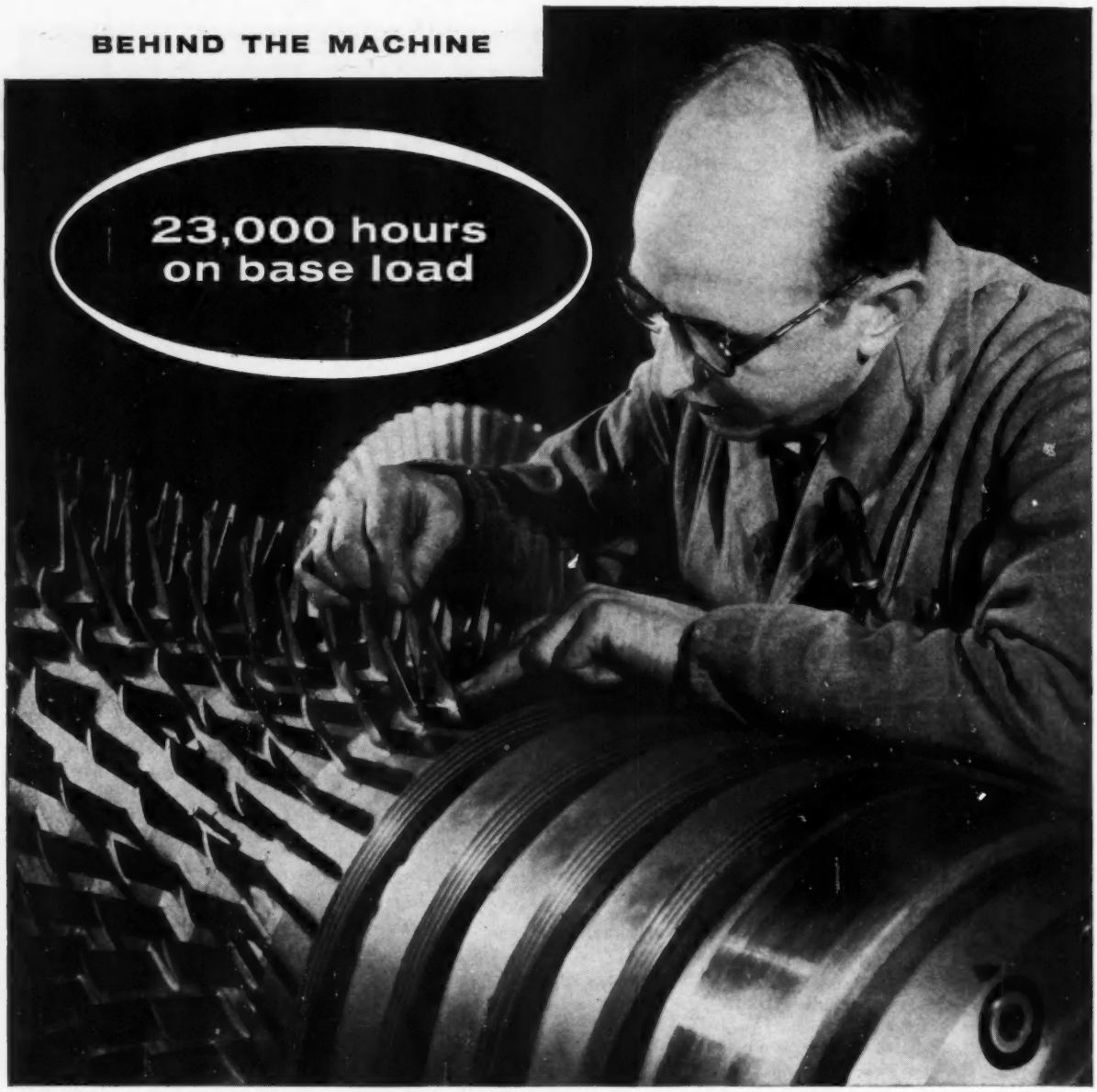
BEHIND THE MACHINE



The proved reliability of AEI industrial gas turbines is typified by a machine in Venezuela which has recently completed 23,000 hours running on base load. AEI makes a range of industrial gas turbines with ratings from 1,750 kW upwards designed to run on gaseous or liquid fuels.

The picture shows work on the compressor rotor of L2IC gas turbines being built, at the AEI Turbine-Generator Division Factory for the Basrah Petroleum Co. These feature a single shaft design which ensures stable regulation and makes them particularly suitable for parallel operation with other generating equipment.

This is a product of AEI Turbine-Generator Division, Britain's largest manufacturer of Turbine-Generators.

AEI **Associated Electrical Industries Export Ltd**
33 GROSVENOR PLACE, LONDON SW1

B/L002

For more information write in No. 184

GT EDITORIALLY SPEAKING

Storehouse, granary or depot . . .

By original definition, a "magazine" was "a place where goods or supplies are stored" . . . a storehouse, granary or depot where you kept buttons, barley or bullets. Well down on the list of Webster's definitions a "magazine" became a "storehouse of information on any subject". Today, this is the broadest meaning, implying a paper-bound periodical published at stated intervals, circulated and read. Business magazines such as GAS TURBINE fit both the original definition and the commonly-accepted meaning, being a storehouse, specifically of information. But a new meaning and function has been added. The storehouse is not static; it's a dynamic means of business and technical communication . . . your best source of current knowledge and ideas that you can put to work. True importance of business magazines is not in their physical properties. It lies in the fact that they are a living force that touches our business life in many ways. They reach the minds, hearts and imagination of their readers. They provide facts, offer ideas. They affect judgements and help make sound decisions possible. In many cases they break down barriers of seeming impregnability. Achieving all this has been our constant aim in bringing you GAS TURBINE. Our first year of publishing is over and we now embark on our second year with excited anticipation. Our plans are aimed at doing even a better job of meeting our stated concept of a good, responsible business magazine.

G. Renfrew Brighton, Publisher

GT HOT LINE

BROWN BOVERI—BRISTOL SIDDELEY MAY TEAM UP . . .

Brown Boveri and Bristol Siddeley are presently studying desirability of the two companies jointly building gas turbine plants for peaking power and similar applications.

FROM PHOENIX TO SAUDI ARABIA, AUSTRALIA AND JAPAN . . .

Nineteen US and foreign airlines are now using AiResearch small gas turbines for commercial jetliner starting and ground power, stationed at 114 locations around the world, according to Garrett Corporation's AiResearch Manufacturing Division, Phoenix, Arizona.

VERTOL USES CT58 TURBINES . . .

General Electric's Small Aircraft Engine Department received from Vertol Division, Boeing Aircraft Corp., an order for 15 gas turbine aircraft engines valued at nearly $1-million. (Option was granted for additional engines.) GE's CT58-100-2 is for Vertol's 107, a 25-passenger commercial turbocopter scheduled to enter airline service in 1961.

GE'S PACKAGED PEAKING PLANT $100 PER KW . . .

J. M. Costello, executive vice president, South Carolina Electric & Gas Company with Alan Howard, general manager and Whitman Ridgeway, manager marketing, Gas Turbine Department of General Electric at Schenectady jointly announced installation in 1961 of two 11,000-kw packaged peaking plants, one each at Beaufort and Charleston, S. C. Housing of the turbo-generator set is only 10 ft., 4 in. wide. Complete unit with accessories can be transported to site by railroad and placed in service in only a few days!

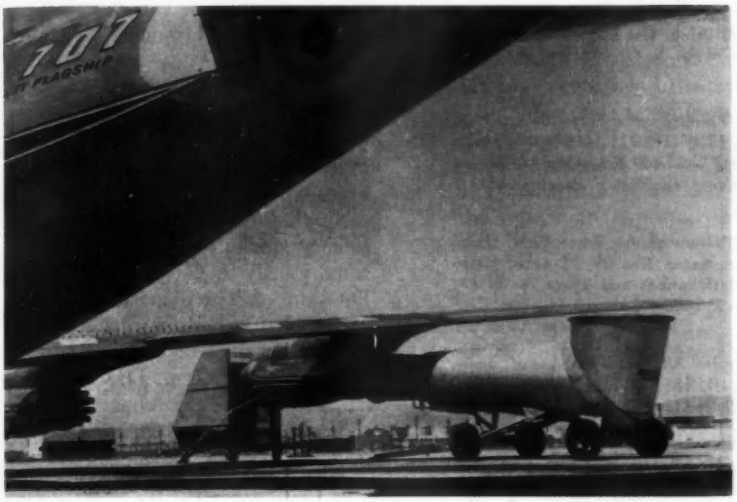
AIRCRAFT JET-TURBINE POWERED 10,500-HP PUMPING STATION NOW OPERATING . . .

This historic announcement was recently made over a closed circuit TV system, announcing the initial start-up of Columbia Gulf Transmission's Pratt & Whitney-Cooper-Bessemer pumping installation. Answering questions from the audience was a panel consisting of Ralph Boyer, vice president, Cooper-Bessemer; Perry W. Pratt, vice president, United Aircraft Corporation; S. Orlofsky, vice president, Columbia Gulf Transmission Company, and Fred W. Batten, vice president, Columbia Gas System. Cost of the pumping station they reported is $190 per hp. Additional units may bring the cost low as $125 per hp it was indicated.

FIRST ORDER FOR BRISTOL SIDDELEY 15-MW PEAKING UNIT . . .

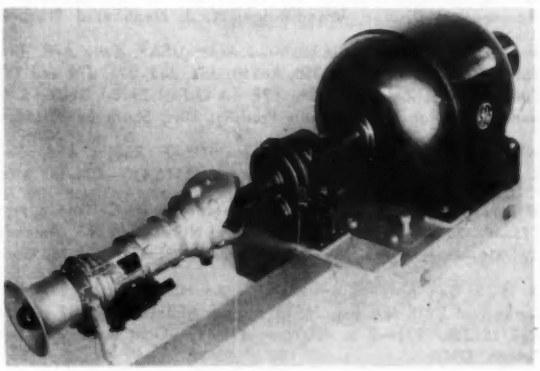
Central Electricity Generating Board of England has placed an order for a Bristol Siddeley 15-mw gas turbo-generator set using the Olympus jet engine as the gas producer. Set will be located at Hams Hall, near Birmingham. It's expected to go into operation by late '62. Bristol Siddeley's Olympus turbojet engine has already established a reputation for performance, reliability and economical operation as the powerplant of the RAF's Vulcan V-bomber. By this ground application, separate free-power turbine converts energy of effluent gases from the Olympus gas generator into shaft power and is coupled directly to the alternator. Principal advantages of the plant are its low capital cost, its suitability for automatic operation under remote control and its very simple maintenance. It's fuel consumption is also good, 0.75 lb/kwh! Weight of power turbine is 10-tons . . . and the jet gas generator only 2.2-tons!

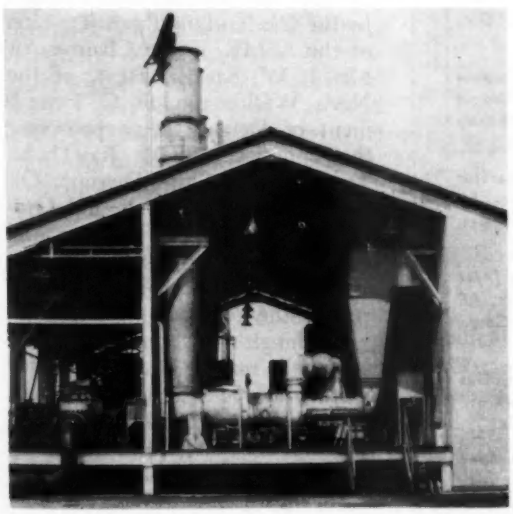
GT INDUSTRY NEWS



Run-Ups Can Be Quiet . . .
New series of portable jet run-up noise suppression systems has been introduced by General Acoustics Corp., designers and manufacturers of noise control equipment for aircraft and missiles. Intake unit on left of engine is compact structure of highly absorptive steel sound-panels mounted on wheeled undercarriage. Exhaust unit on right is adjustable to engine. Exhaust suppressor contains high-temp steel augmentor-diffuser elements.

Standby Turbine Will Reside On Roof . . .
Scale model of General Electric's remote-controlled gas turbine-generator unit that's scheduled to begin operation this month as a standby power source. Entire unit weighs only 6 tons plus the 320-lb turbine—allowing it to be installed on roof of Pacific Telephone & Telegraph Company building in Oakland, Calif. On the left is GE's 720 industrial turbine. Engine's 19,500 rpm is lowered to 1200 rpm by reduction gearing (center). At right is the 750-kw, 4160-volt synchronous generator.





R & H Turbine Pulls Desert Duty . . .
Arabian American Oil Company operates no fewer than 11 1260-bhp Ruston & Hornsby turbines for crude oil pumping duties at three of their station installations. They're located in Saudi Arabia—in Safaniya, Nariya and (station shown in picture, left) at Khursaniyah.

MORE INDUSTRY NEWS FOLLOWS ►

CONTRACTS PROCUREMENTS

Some major gas turbine procurements initiated and contracts awarded during recent months by various agencies of the U. S. Government are listed. This material is from the U. S. Department of Commerce publication "Synopsis of U. S. Government Proposed Procurement, Sales and Contract Awards."

• AMC Aeronautical Systems Center, USAF, Wright-Patterson Air Force Base, Ohio. "Cartridges, Starter, Aircraft Engine, Type MXU-4/A, FSN/1375-723-3425-M379, 36222 each, and Data. For: F-105 Aircraft. (PR 00-0-1375-5092)"—$1,009,869—Olin Mathieson Chemical Corp., East Alton, Ill. This was a competitively negotiated procurement. 2 bidders were solicited and 2 proposals were received.

• AMC Aeronautical Systems Center, USAF, Wright-Patternson Air Force Base, Ohio. "J79-GE-5B Turbojet Aircraft Engines with Afterburner, Aerno 35-6109, 72 each; Data, Ground Support Equipment and Spare Parts. Usage: Installations and Spare for B-58A Aircraft. (PR's EP-0-2840-6759; EU-0-2840-6769"—$4,735,000—General Electric Co., Flight Propulsion Division, Cincinnati 15, Ohio.

• HQS, Warner Robins Air Materiel Area, USAF, Robins Air Force Base, Ga. "Bearings for T56, 256A1A and A9, Gear Box, C-130 Aircraft, (RFP-60-2548)"—$201,750—SKF Industries Inc., Philadelphia 32, Pa. 8 bidders solicited and 4 proposals received.

• Bureau of Naval Weapons, Washington 25, D. C. One hundred Model J57-P-43WB Engine in accord with Pratt & Whitney Div., Spec. No. A-1704-E. NOw 60-0218-i, Amend No. 11—$14,818,200—Pratt & Whitney Aircraft Div., East Hartford, Conn.

• HQS, Middletown Air Material Area USAF Olmsted AFB, Pa., In-Serviced Engineering for Navy J-65 engines—$3,908,750—Curtiss-Wright Corporation, Wright Aeronautical Division, Wood-Ridge, N. J. Negotiated Procurement.

• HQS, San Antonio Air Material Area, USAF, Kelly AFB, Texas. Spare Parts. Applicable to R1830, R2800, R3350, R4360, J57, J65, J71, J79 and T56 Engines. AF 41(608)-10658, Production List 77-SA, (PR SA-O-FSC-2915-E12603—5 to 1000 ea—$124,923—Bendix Aviation Corp., Bendix Products Div., South Bend, Ind.

• Warner Robins Air Material Area, USAF, Robins AFB, Ga. Dynamotor, 6000 HP Applicable to Test Cell for T-56 Engine—$116,430—Clayton Mfg. Co., El Monte, Calif.

• Bureau of Naval Weapons, Washington 25 D. C. One hundred twenty-three Model J75—P—20 Engines with Afterburners. NOw 60-0218-i, Amendment Number 7—$25,-220,904—Pratt & Whitney Aircraft Division, East Hartford, Conn.

• HQS, San Antonio Air Material Areas, USAF, Kelly AFB, Texas. Spare Parts, in support of R975-46A Eng J69T2 engine. AF01(601)-29832, Production List 3-SA (MIPR R60/251278/383)—2 to 4700 ea—$28,519—Continental Aviation & Engineering Corp., Toledo, Ohio.

• AMC Aeronautical Systems Center, Wright Patterson AFB, Ohio. J79-GE-11A Turbojet Engines with Afterburner, iaw/Contractor's Spec E-716E dtd 21 Jun 60. Contract AF 33(600)-42021—48 ea—$2,862,000—General Electric Co., Flight Propulsion Div., Cincinnati 15, Ohio.

• Bureau of Naval Weapons, Washington 25, D.C. Fifty-three Model J60-P-3 Engines in accord with Pratt & Whitney Aircraft Spec No. A-2412 C including P&WA Layout LC-40824, Change A2. NOas 59-8073-f, Amend No. 10—$3,339,583—Pratt & Whitney Aircraft Div., East Hartford, Conn.

• HQS, 2709th AF Vehicle Control Group, USAF, Memphis, Tenn. Starter Generator applicable MA-1 Gas Turbine Driven Compressor FSN 2920-596-9945, Contract AF 40(604)-10910—150 ea—$37,852—Electronic Specialty Co., EEMCO Div., Los Angeles, Calif., Negotiated procurement.

• HQS, San Antonio Air Material Area, USAF, Kelly AFB, Texas. 2915-767-5194 (P/N 380990) Nozzle Assy. Applicable to J75-5/7 engine in support of F105 aircraft. AF 41(608)-12186 (PR SA-O-FSC-2915-E11929 & -1) 440 ea—$449,100—The Bendix Corp., Eclipse Machine Div., Elmira, N. Y.

• AMC Aeronautical Systems Center, Wright-Patterson AFB, Ohio. Power Unit, Gas Turbine Engine, Type A/32A-3, Aerno 42-2352. Letter Contract AF 33(600) 41949 dtd 29 Jul 60—$393,600—the Garrett Corp., AiResearch Mfg. Co. Div., Phoenix, Ariz.

• Bureau of Naval Weapons, Washington 25, D.C. 80 Blade Assys in accord with Spec MIL-H-8729A(USAF). NOw 60-0493-r, Amd No. 1—$234,560—Hamilton Standard Div., Windsor Locks, Conn.

INDUSTRY NEWS . . .

GE's Ralph Cordiner Looks Ahead

"Jet engines for commercial aircraft and stationary gas turbines for industry and utilities" is one of the five major new company ventures recently announced by Ralph Cordiner, Chairman of the Board of General Electric.

Washington, D. C. Site For 6th Gas Turbine Conference

Sixth annual Gas Turbine Conference and Products Show sponsored jointly by Gas Turbine Power Division of The American Society of Mechanical Engineers and the US Department of Defense will be held in Washington, D. C., March 5-9, 1961 at the Shoreham Hotel.

Technical papers covering recent progress in gas turbines will be presented . . . papers and discussions will cover the gas turbine fields of aircraft, automotive fuels, and combustion, industrial, marine, nuclear, rail and central station power plants.

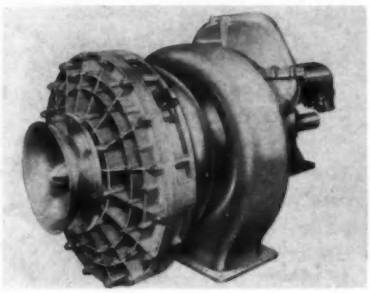
Exhibits will be on display at both the Shoreham Hotel and at the Pentagon where there will be operating exhibits demonstrating applications of gas turbines (Among the operating exhibits are expected to be vehicles powered by gas turbines, turbine-driven marine craft and turbo water pumps.) Displays at the Shoreham will be exhibited in over 50 booths, "and will clearly depict the recent strides made by US industry in the gas turbine field."

This conference is being arranged by the Gas Turbine Power Division of the ASME, whose Chairman is Mr. J. W. Sawyer, Dept. of the Navy, Washington, D. C. Department of Defense is co-sponsoring the conference, and Mr. Ray Hicks, Transport and Ships Division, Office of Fuels, Materials and Ordance, Department of Defense, has been appointed to cooperate in arranging the gas turbine operating units at the Pentagon.

Washington Section of ASME is assisting in making arrangements for this conference and exhibit through a local committee with Mr. J. W. Abouchar of Western Gear Corp., serving as General Chairman.

Advance programs are available

from the American Society of Mechanical Engineers, Meetings Department, 29 West 39th Street, New York 18, N. Y.



Waukesha's New Gas Turbine

The Waukesha Motor Company, manufacturer of heavy duty industrial internal combustion engines since 1906, has developed an industrial type gas turbine. This new unit develops 400 horsepower for use in industrial, military, marine, automotive, oil field, and similar applications. Design, assembly, and testing of the turbine was done in collaboration with the Williams Research Corporation in that company's laboratories near Pontiac, Michigan. The simple ruggedness of the new turbine represents a radical departure from the light weight complex aircraft turbines currently being converted by aircraft companies for industrial uses. It incorporates a centrifugal compressor with its turbine, annular combustor, a free turbine section, and integral speed reducing gear case. The 400 hp rating can be provided at output shaft speeds of 2500 rpm or 3600 rpm with the free shaft feature providing very high torque at zero rpm. It is an icipated that this same engine will be rated in the future at 600 hp for some applications. The conservative design provides for a full power minimum period, between overhauls, of 20,000 hours. This overhaul period should be extended many-fold at reduced power ratings. Use of sleeve bearings, throughout, (including high speed shafts bearings), is one of many innovations identifying this engine as a heavy duty unit. For detailed specifications see the main table in this issue.

"Great Things" Expected Of Gas Turbine Engine By Trucking Industry

A 200-lb. gas turbine engine, which would replace present 2500-lb. truck engines, was offered as one of the highlights in the future technical development of the trucking industry. Welby M. Frantz, of Terre Haute, Ind., president of the American Trucking Associations, said high hopes are prompted by the "light-weight," compact design and probable simpler maintenance of the gas turbine engine. "Gas turbines pack an enormous wallop in a 200-lb. package of turbine."

Our Consulting Editor Receives Interesting Letter

Dear Mr. Sawyer,

We have just had the Proteus engine out of Donald Campbell's car back for inspection after his crash. The engine was still running after the crash. So far as we have been able to tell by a preliminary examination it is undamaged but we are carrying out a detail inspection. The car is being rebuilt for another attempt on the record next year.

The twin-Proteus-engined fast patrol boat built by Vospers, Ferocity is now on a demonstration cruise in the Baltic. This vessel has small diesel engines driving the same propellers as the turbines. Control arrangements for changing over from diesel to gas turbine power have worked out very well using an S.S.S. clutch on the turbine drive which engages automatically when the gas turbines are started. Diesels are automatically disengaged when the gas turbine throttles are advanced beyond the slow running position. All this is controlled from the bridge and I think all have been surprised at the simplicity of the control.

Best wishes,
B. G. Markham
Bristol Siddeley Engines Ltd.

Radical New Space Plane

Gas turbines will probably be used up to 75 miles above the earth in a radical new USAF "space plane"—beyond that into space the conventional rocket system will take over. USAF is requesting $20-million for Fiscal 1962 budget to cover studies and research. Flight tests are expected between 1966 and 1968.

GT "COMING UP" REMINDER

FEBRUARY 19-23 American Institute of Mining, Metallurgical and Petroleum Engineers Annual Meeting, St. Louis, Mo.

FEBRUARY 26-MARCH 1 American Institute of Chemical Engineers, Roosevelt Hotel, New Orleans, La.

MARCH 5-9 Gas Turbine Conference and Products Show, Shoreham Hotel, Washington, D. C.

MARCH 14-16 Society of Automotive Engineers, Inc., National Automobile Meeting, the Sheraton-Cadillac Hotel, Detroit, Michigan.

MARCH 20-22 Society of Automotive Engineers, Inc., National Production Meeting, Netherland Hilton Hotel, Cincinnati, Ohio.

MARCH 27-31 Instrument Society of America, 3rd Symposium on Temperature—Its Measurement and Control in Science and Industry. Sponsors: ISA, AMERICAN INSTITUTE OF PHYSICS, NATIONAL BUREAU OF STANDARDS. Veteran's Memorial Hall and Deshler-Hilton Hotel, Columbus, Ohio.

APRIL 4-7 SAE National Aeronautic Meeting, including production forum and engineering display. Hotel Commodore, N.Y.C.

APRIL 10-12 American Institute of Mining, Metallurgical and Petroleum Engineers, Inc., Open Hearth and Blast Furnace Conference, Sheraton Hotel, Philadelphia, Pa.

APRIL 17-19 Seventh National Instrument Society of America Symposium on Instrumental Methods of Analysis, Shamrock Hilton Hotel, Houston, Texas.

APRIL 17-21 American Welding Society Annual Meeting and Welding Exposition, Hotel Commodore, New York, N. Y.

APRIL 30-MAY 4 Seventh National Aero-Space Instrumentation Symposium Adolphus Hotel, Dallas, Texas.

Reserved Your Booth?

Reports are that over 35 of the major gas turbine and accessory suppliers have already taken space at the Gas Turbine Conference and Products Show scheduled for the Shoreham Hotel, Washington, D. C., March 5-9, 1961.

GT PEOPLE PLANTS PLACES

J. W. Sawyer

Sawyer, Chairman Gas Turbine Power Division

John W. Sawyer, the new Chairman, **Gas Turbine Power Division of ASME**, is with Ship's Research Branch, Applied Research Division, Bureau Ships, US Navy. He left N. C. State College with a B.S.E.E. in 1933 to be a marine engineer at sea until 1936, receiving a B.M.E. from Ohio State University in 1938. He entered military service in 1943. In 1949 he left the service as Lt. Commander becoming head special products section Steam Turbine, Gear Branch, Bu Ships. From here John Sawyer rapidly moved up to assistant to Head of Steam Turbine Branch and then head engineer Gas Turbine Branch.

By this time John had a worldwide reputation as an outstanding gas turbine authority as well as a qualified marine engineer. His business travels took him to England, Switzerland and other European countries. He holds eight US patents and has written many technical articles as well as presenting over 30 papers before the various technical professional societies. John Sawyer is an active member of ASME, ASNE, SAE and Professional Engineers. Space does not allow us to enumerate the many positions he has held in these technical societies as well as committee work including Bu Ships Incentive Awards and numerous Bu Ships Selection Boards.

EDITOR'S NOTE—We are also proud to have J. W. Sawyer as our leading Contributing Editor who has furnished many valuable articles.

Pitt, Alpert Move Up

Paul A. Pitt has been elected vice president-engineering of **Solar Aircraft Company**, a subsidiary of **International Harvester Company, Herbert Kunzel**, Solar president, has announced. In his new position, Pitt heads Solar's engineering and research activities. At the same time, **Sumner Alpert** was named manager of a new division which includes Solar's aerospace, ground support and industrial products, with responsibility for sales and project engineering in these areas.

Prior to his new appointment, Pitt has been Solar's chief engineer since 1955. He joined the company in 1942 and has led the development of Solar's gas turbines, controls and turbomachinery. A leading authority in the turbine field, he did pioneer work in the development of small gas turbines and afterburners dating back to the 1940's and has published several papers on these subjects. Alpert, formerly chief technical engineer, joined Solar in 1951. From 1944 to 1950 to was a scientist with National Aeronantics and Space Administration.

Universal Oil Products Expands

Catalytic Combustion Corporation has become a wholly owned subsidiary of **Universal Oil Products Company.** Universal's leadership in catalytic research has long been recognized. Now, by combining Catalytic Combustion Corporation's developments the widest possible range of catalytic applications are brought under one corporate structure.

Ray Raupp, Chief Engineer

Appointment of **Ray J. Raupp** as Chief Engineer for Bendix Filter Division, **The Bendix Corporation,** Madison Heights, Michigan, is announced by **M. J. Kennedy,** General Manager of the Division. He has over 20 years of experience in all phases of fluid systems engineering.

D. E. Salter

Boeings Stalter Gets New Duties

David E. Stalter, director of marketing, **Boeing Industrial Products Division,** will have overall direction of market research, sales planning, field sales activities, service and spares operation.

Pall Corporation Appointments

Three new assistant chief engineers have recently been appointed at **Aircraft Porous Media, Inc.,** a subsidiary of **PALL Corporation.** At the same time a sales manager for **Micro Metallic Division** of PALL Corporation was also appointed. All the positions are new and have been created to cope with the expanded areas of activities resulting from continued corporate growth.

The three new assistant chief engineers are: **Leslie Seawert, S. R. Jupiter** and **Marcel Verrando;** formerly group engineers responsible for specialized areas of filter development. The new sales manager is **Stanley Sakol,** formerly Assistant Sales Manager.

Merger

Precision Metalsmiths, Inc., Cleveland will acquire intricast Inc., Loudonville, Ohio effective January 1, 1961. The acquisition will operate as Precision Metalsmiths, Inc., Intricast Division and with the main interest of producing low cost, high quality investment castings for commercial applications. Precision Metalsmith, Inc., has expanded its resources, facilities and technical group to provide ferrous and nonferrous investment castings of reliability for both commercial and military applications.

A. Howard

Howard Returns to Schenectady

Alan Howard, who has been Manager-Engineering for General Electric's Medium Steam Turbine, Generator and Gear Department at Lynn, Mass., since 1954 is returning to Schenectady as General Manager of the Gas Turbine Department.

Alan Howard joined G. E. in 1927 upon graduation from Purdue. In 1954 Purdue awarded him an honorary Doctor of Engineering degree. From 1940 to 1946, Mr. Howard was responsible for the design and development of the TG-100, the world's first aircraft gas turbine for propeller drive, and the TG-180 jet unit from which GE's J-47 jet engine was directly developed. For this work, he received the Coffin Award, the highest honor given by the Company to an employee. He now holds 24 patents in these and related fields.

In 1946, Mr. Howard became engineer in charge of development of all General Electric's non-aircraft gas turbines, and in 1952 he attained the position of Manager of the Engineering Department of the Turbine Division until he moved to Lynn.

Alan Howard's many gas turbine friends will welcome him back into the fold. He was Chairman in 1954 of the Gas Turbine Power Division of ASME. Through the years did considerable to help this division and to expand the gas turbine in the railroads, pipeline and power fields.

Burgess-Manning Promotions

William A. Carroll, Jr., was advanced to manager of marketing, and R. T. Oliver, Jr., to sales manager for domestic operations of Burgess-Manning's Industrial Silencer Division.

Donaldson-Hydrodyne Complete Merger

Donaldson Co., St. Paul, Minn., in purchasing controlling interest in Hydrodyne Corp., North Hollywood, Calif., entered the missile and avionics industry.

Hydrodyne, founded in 1956, makes components—seals, bellows and filters—used in pneumatic, hydraulic and fuel systems of missiles, rockets and high speed aircraft. 40 engineers and technicians are employed, and 1959 sales amounted to more than $1,300,000.

Donaldson produces heavy duty oil bath and dry air cleaners and mufflers for internal combustion engines. Their sales were over $10-million last year. 600 people are employed.

The seemingly unrelated products of the firms will serve each other in a complementary manner in relation to fluid handling, according to Frank Donaldson, President.

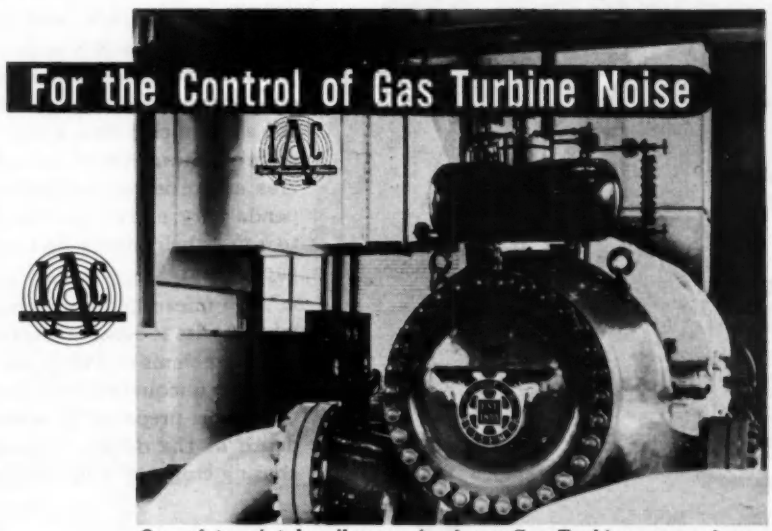
Hydrodyne will be operated as a partially-owned subsidiary of the St. Paul Company, from its plant in North Hollywood.

AiResearch Announces Promotions For Three

Three new appointments in The Garrett Corporation's AiResearch Manufacturing Company of Los Angeles were announced by Richard E. Palmer, division manager. James V. Crawford has been promoted to the position of assistant manager of the Los Angeles division, Dr. John Mason was promoted to chief engineer replacing Crawford and Richard Winslow has been named chief of preliminary design.

New Nugent Representative

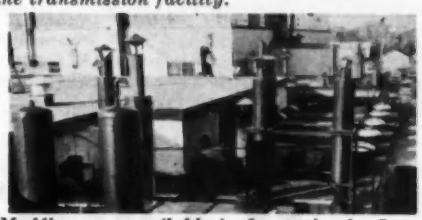
F. L. Townsend, Sales Manager of Wm. W. Nugent & Co. (Inc.), Skokie, Illinois, announces the appointment of T. F. Hudgins & Assoc. Inc., 3202 Mercer Street, Houston, Texas, as their exclusive representative in the States of Louisiana, Alabama and Mississippi. T. F. Hudgins & Assoc., Inc., will replace Fred M. Erichson, New Orleans, Louisiana, who resigned as representative for the Nugent Company on November, 1960. T. F. Hudgins & Associates continue as exclusive representatives in Texas.



One of two intake silencers for large Gas Turbine powered compressor in a gas pipe line transmission facility.

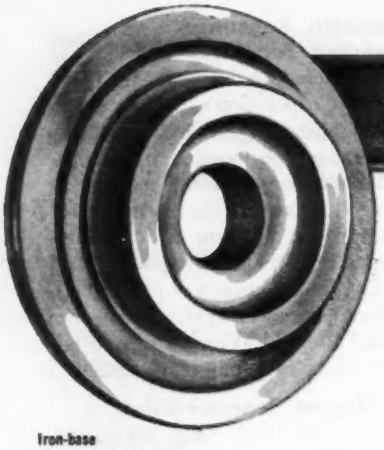
IAC Intake and Exhaust Silencers have solved special noise problems in hundreds of installations. Our Engineering Department will gladly work with you in solving your noise problems.

INDUSTRIAL ACOUSTICS COMPANY, INC.
341 Jackson Avenue
New York 54, N. Y.
CYpress 2-0180



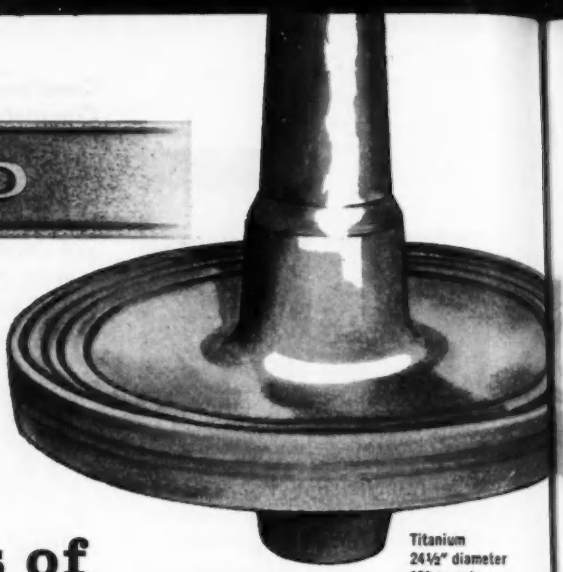
IAC Mufflers are available in five series for Low to High (up to and including Sonic-Flow) velocities. Ask for Bulletin #MUF-218.

For more information write in No. 185



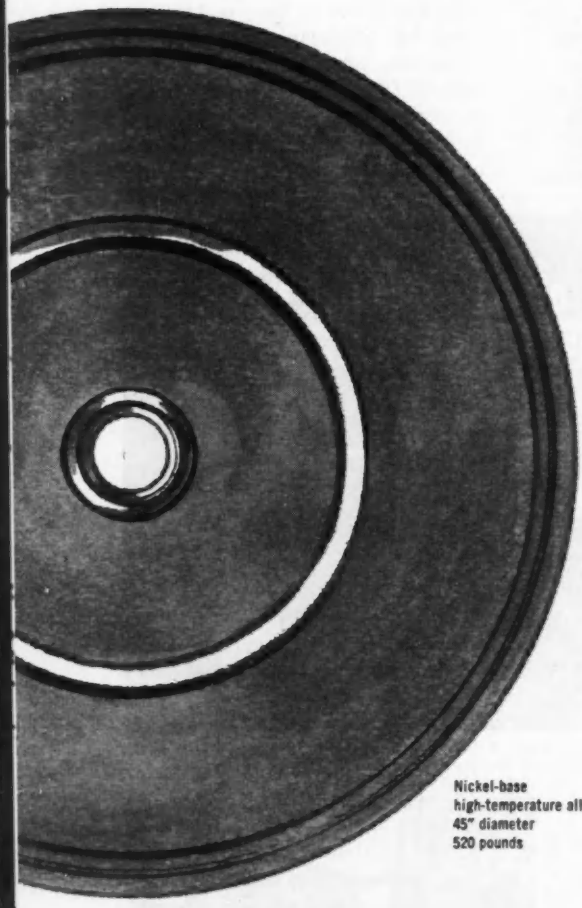
Iron-base
high-temperature alloy
21½" diameter
244 pounds

FORGED



Titanium
24½" diameter
191 pounds

To speed the progress of gas turbine development

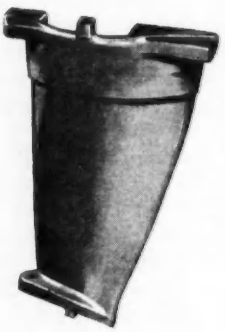


Nickel-base
high-temperature alloy
45" diameter
520 pounds

For applications ranging from automotive to aircraft propulsion, Wyman-Gordon is the world's largest producer of forged components for the gas turbine industry—turbine wheels, compressor discs, blades and vanes, for stationary turbines, nuclear installations, aircraft and missiles.

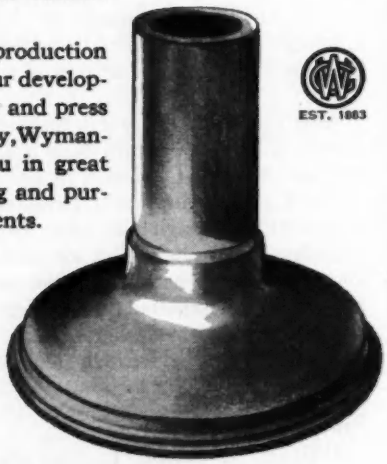
Wyman-Gordon's production experience includes forgings of a wide range of metals from low-alloy high-strength steels—titanium—intermediate temperature alloys—to the super-nickel-base alloys and refractory metals. *Guaranteed minimum properties* assure improved performance and dependability, and enable designers constantly to raise their sights and increase turbine capabilities.

With unexcelled research and production laboratories to concentrate on your development problems and with hammer and press capacity unequalled in the country, Wyman-Gordon is prepared to serve you in great depth at the design, engineering and purchasing stages of your requirements.



Titanium
15½" length

EST. 1883



High-strength steel
19" diameter
143 pounds

WYMAN-GORDON

FORGINGS

of Aluminum Magnesium Steel Titanium . . . and Beryllium Molybdenum Columbium and other uncommon materials

HARVEY ILLINOIS WORCESTER MASSACHUSETTS DETROIT MICHIGAN
GRAFTON MASSACHUSETTS LOS ANGELES CALIFORNIA PALO ALTO CALIFORNIA FORT WORTH TEXAS

For more information write in No. 186

Gas Turbine Specifications - 1961

Over 270 Models for Industry and Commercial Airlines

This listing represents products of 46 manufacturers in nine countries. Largest model is a 53,600-hp unit built by DeLaval Ljungstrom Turbine Company, Sweden, and the smallest, a 70-lbt unit built by Williams Research Corporation, Michigan. Eight companies list only one turbine model while ten companies list ten or more models, going as high as General Electric with 26 models. Turbines of all types and sizes ARE available.

Checking rated fuel consumptions, large-turbine rates range from 0.40 lb/hp hr, up. Best fuel consumption listed (at 60°F amb) for a jet unit is 0.72 lb/lbt hr; for a turbo-fan, 0.50 lb/lbt hr; and for the turbo-prop is 0.46 lb/ehp hr. Among automotive-type units, Chrysler's quoted consumption of 0.51 lb/hp hr (at 85°F amb) is the lowest in the listing.

Data given in this listing is intended purely as a guide for preliminary selection. For this reason, data presentation is as consistant as possible to give a basis for direct comparison. Further study will be necessary to arrive at conclusions for a specific application. For example, one manufacturer might quote a higher fuel consumption than another in the context of this listing. Yet in a specific application, the accessories, range of ambient temperatures and other items might change the comparative fuel rate completely.

Explanatory Notes for Columns (see first listing)

A Manufacturer's model number.

B Use or application. See "Symbols" for code meanings.

C Ratings in "hp" at shaft coupled to generator, pump or other load, unless otherwise indicated. In some cases, rating is given directly in "MW". Also, rating is at 59°F or 60°F unless otherwise shown.

D Fuel consumption given in "lb/hp hr" unless otherwise indicated. If rating in columns C and E are in "lbt", figures indicate "lb/lbt hr".

E Same as in column C except no "MW" ratings are given. For conversion, MW/0.7 is used.

F Same as column D except indicating maximum rating.

G-K Data on power shaft for most turbines except jets. Dual-shaft jets list the low-pressure or lower-speed shaft under "Power Shaft". Note on column G: Turbine rpm is given, not rpm or shaft out of gear box as this often changes with different applications of same turbine.

K-L Note: For convenience, symbol "NP" has been inserted in these columns in a few cases. It simply indicates that the complete turbine unit is not yet in production.

L-O Data on compressor shaft and its turbine.

P Number of combustors. An annular combustor is counted as one.

Q Reheat or afterburner.

R Indicates either intercooler or method of cooling the air prior to entering compressor.

S Type of heat recovery. "OP" (optional) in either column S or T means that there is sufficient heat in the exhaust to permit heat exchanger installation if requested by user.

T Closed cycle or other heat exchanger specialties are indicated here.

U Many detailed fuel specifications were furnished by manufacturers. In some cases these have been briefed. On specific questions, write GAS TURBINE for further details.

V In many cases, heavy fuel is washed and centrifuged. This is not listed as treating; nor is electrostatic cleaning of gas fuel considered as treating. "Treating", here, refers to a chemical application or change, not cleaning.

W Total weight given in pounds only.

W-Z Weight and dimensions are for stripped unit unless otherwise indicated.

SYMBOLS

A = Axial
a = Including accessories (weight & dimensions)
Aa = Aft Fan Jet
Ab = Bypass Jet
AC = Air Compressor Drive
Ad = Additive
Adv = Additive for Vanadium
Af = Forward Fan Jet
ahp = Air horsepower
Aj = Pure Jet
AK = Aviation Kerosene
Ap = Prop Turbine
APU = Auxiliary Power Unit
AS = Air Supply
Au = Automotive
AW = Air to Water
BF = Blast Furnace
C = Centrifugal
CC = Closed Cycle
CFS = Cubic feet per second
E = Extraction Unit
ehp = Equivalent horsepower
Fg = Gaseous Fuel
Fl = Liquid Fuel
Fn = Nuclear Fuel
Fs = Solid Fuel
G = Generator Drive
g = Including reduction gear (Weight & Dimensions)
GC = Gas Compressor Drive
GG = Gas Generator
H = Helicopter
h = Including heat exchanger (weight & dimensions)
hp = Horsepower
hr = Hour
hw = Including heat exchanger (weight only)
I = Industrial
L = Locomotive
lbt = Pounds thrust
M = Marine
MW = 1,000,000 watts
N = No
NA = Not Available
NP = Complete turbine unit not yet in production.
O = Oil Pump Drive
Op = Optional
P = Portable
PL = Peak Load
Pr = Process
R = Radial Inflow
Rt = Rotary Heat Exchanger
S = Stationary Heat Exchanger
Sa = Hot Air heat recovery
SFC = Specific Fuel Consumption in lb/hp hr or lb/lbt hr.
Sh = Hot Water heat recovery
SP = Shaft Power
St = Steam
W = Water Pump Drive
Y = Yes

AiResearch Manufacturing Co., Phoenix, Arizona (Div. The Garrett Corporation)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
						POWER SHAFT					COMP. SHAFT						HEAT EXC. USED			FUEL			DIMENSIONS IN INCHES		
						TURBINE			COMP.		TURB.		COMP.												
MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	RPM	Type	Stages	Type	Stages	Type	Stages	Type	Stages	No. Comb.	Re Heat	At Comp.	Ex. Heat	OTHER	TYPE	Treating	DRY WEIGHT lb	L	W	H
GTP80	—[1]	35.5	1.53	—	—	—	R	1	C	1	—	—	—	—	1	—	—	Op	—	Fl	—	48[6]	20	22	22
GTP70	W,O[1]	160	1.10	—	—	—	R	1	C	2	—	—	—	—	1	—	—	Op	—	Fl,Fg	—	200[6]	32	30	29
GTCP105	SP,AS	125	—	435[2,5]	1.04	—	R-A	1-1	C	2	—	—	—	—	6	—	—	Op	—	Fl	—	389[6]	57	26	26
GTCP85	SP,AS	170	1.41	154[2,4]	1.52	—	R	1	C	2	—	—	—	—	1	—	—	Op	—	Fl	—	260[6]	38	33	33
GTC85	AS	—	—	200[2,5]	1.18	—	—	—	—	—	R	1	C	2	1	—	—	Op	—	Fl	—	230[6]	39	35	35

Footnotes: [1]-G,APU; [2]-ahp; [3,4,5]-Air flow lb/min at press. ratio . . . [3]-202 at 5:1 . . . [4]-116 at 3.34:1 . . . [5]-132 at 3.69:1; [6]-a

W. H. Allen Sons & Co., Ltd., Bedford, England

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
	M,APU	.115MW	1.72	200	—	23,000	R	1	C	1	—	—	—	—	1	—	—	—	—	Fl	N	2690[2]	62	40	68
	M,APU	.350MW	1.42	500	—	15,000	A	2	C	1	—	—	—	—	1	—	—	—	—	Fl	N	3700[2]	102	66	84
	M,G	.500MW	1.25	786	1.21	16,000	A	2	C	1	—	—	—	—	1	—	—	—	—	Fl	N	3700[2]	108	70	88
	G	.885MW	—	1643	—	7500	A	3	A	15	—	—	—	—	1	—	—	—	—[1]	—	—	16,000[2]	162	72	72

Footnotes: [1]-Waste heat recovery; [2]-a,g

Allgemeine Elektricitaets-Gesellschaft, (AEG) Berlin-Grunewald, Germany

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
—	BF	5.44MW	NP	8300	—	—	A	—	A	—	—	—	—	—	—	—	—	Y	—	Fg	—	—	—	—	—

Allison Div. of General Motors Corp., Indianapolis, Ind.

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT: TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT: TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED: At Comp.	Ex. Heat	OTHER	FUEL: TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
501-D13	1	3420[3]	.55	3750[3]	.54	13,820	A	4	A	14	—	—	—	—	6	N	—	—	—	F1	N	1756[5,6]	145	30	42
501-D22	1	3730[3]	.53	4050[3]	.52	13,820	A	4	A	14	—	—	—	—	6	N	—	—	—	F1	N	1835[5,6]	146	30	42
GMT-305-B	8	175[4]	.58	206[4]	.56	25,000	A	1	—	NP	A	1	C	1	2	N	N	Rt	—	F1,Fg	N	765[5,6,7]	41	32	28

Footnotes: [1]-Ap,AC,G,GC,O,W; [2]-Au,G,M; [3]-ehp; [4]-at 80°F amb; [5]-a; [6]-g; [7]-h

Associated Electrical Industries, Ltd., Manchester, England

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT: TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT: TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED: At Comp.	Ex. Heat	OTHER	FUEL: TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
L.21C	1	2.5MW	.79	3930[3]	.75	7000	A	4	A	14	—	—	—	—	6	N	—	—	—	F1,Fg	N	50,000	291	75	72
L.21D	1	2.15MW	.84	3630[3]	.79	7000	A	4	A	14	—	—	—	—	1	N	—	—	—	F1[4]	Ad	54,000	291	75	72
L.21D/R	1	2.3MW	.60	3830[3]	.57	7000	A	4	A	14	—	—	—	—	1	N	—	S	—	F1,Fg	N	54,000	291	75	72
L.21D/R	1	1.95MW	.66	3280[3]	.61	7000	A	4	A	14	—	—	—	—	1	N	—	S	—	F1[4]	Ad	54,000	291	75	72
L.51C	1	6.5MW	.70	10,000[3]	.68	4360	A	5	A	18	—	—	—	—	6	N	—	—	—	F1,Fg	N	132,000	415	115	100
L.51D	1	5.0MW	.78	8570[3]	.73	4360	A	5	A	18	—	—	—	—	1	N	—	—	—	F1[4]	Ad	144,000	415	115	100
L.51D/R	1	5.8MW	.56	9780[3]	.52	4360	A	5	A	18	—	—	—	—	1	N	—	S	—	F1,Fg	N	144,000	415	115	100
L.51D/R	1	4.7MW	.62	8210[3]	.57	4360	A	5	A	18	—	—	—	—	1	N	—	S	—	F1[4]	Ad	144,000	415	115	100
K.120	1	13.5MW	NP	24,300[3]	—	4360	A	3	A	13	—	—	—	—	6	N	—	—	—	F1,Fg	N	159,000	318	156	160
G.4	M	4500	.71	—	—	6200	A	2	—	—	A	2	A	13	6	N	—	—	—	F1	N	16,800	195	75	69
G.6	9	7500	.71	—	—	4900	A	2	—	—	A	2	A	13	6	N	—	—	—	F1	N	45,000	260	79	86

Footnotes: [1]-AC,G,GC,O; [2]-M(NP for AC,GC,O; [3]-amb 32°F; [4]-heavy fuel oil

Blackburn Engines Ltd., Brough, England

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT: TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT: TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED: At Comp.	Ex. Heat	OTHER	FUEL: TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
Palas 600	Aj	359[3]	1.19	390[3]	1.20	34,000	—	—	—	—	A	1	C	1	1	N	—	—	—	F1	N	170[7]	46	18	18
Nimbus A129	1	815	.71	968	.68	30,000	A	1	—	—	A	2	A-C	2-1	1	N	—	—	—	F1	N	390[7,9]	62	29	29
Turmo 603	9	375	1.13	425	1.10	26,000	A	1	—	—	A	1	C	1	1	N	—	—	—	F1	N	370[7,8]	48	27	30
Artouste 600	Ap,APU	414	1.02	472	.98	35,000	A	2	C	1	—	—	—	—	1	N	—	—	—	F1	N	295[7,8]	54	18	18
Artouste 510	APU	[4]	—	—	—	34,200	A	2	C	1	—	—	—	—	1	N	—	—	—	F1	N	235[7,8]	37	18	19
Palouste 505	AS,APU	[5]	—	—	—	34,000	—	—	—	—	A	2	C	1	1	N	—	—	—	F1	N	214[7]	34	18	18
Palouste 502	AS,APU	[6]	—	—	—	34,000	—	—	—	—	A	2	C	1	1	N	—	—	—	F1	N	215[7]	34	18	18

Footnotes: [1]-Ap,APU,M; [2]-Ap,AC,M; [3]-lbt; [4]-100 hp + 25.46 CFS (330 lb/hr) or 31.35 CFS (300 lb/hr); [5]-34.95 CFS (291 lb/hr); [6]-26.1 CFS (280 lb/hr); [7]-a; [8]-g

Boeing Airplane Company, Industrial Products Division, Seattle, Washington

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT: TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT: TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED: At Comp.	Ex. Heat	OTHER	FUEL: TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
502-10C	SP[1]	240	1.00	270	0.97	28,500	A	1	—	—	A	1	C	1	2	N	—	—	—	F1	N	330[4,5]	42	24	24
502-10MA	SP[1]	300	.92	330	.90	29,400	A	1	—	—	A	1	C	1	2	N	—	—	—	F1	N	335[4,5]	42	24	24
502-11B	AS	195[2]	1.06	205[2]	1.02	28,500	A	1	C	1	A	1	C	1	2	N	—	—	—	F1	N	410[4]	46	24	26
502-10W	Ap	270	.94	325	.89	27,800	A	1	—	—	A	1	C	1	2	N	—	—	—	F1	N	325[4,5]	45	24	24
502-10WA	H[3]	270	.94	285	.93	28,500	A	1	—	—	A	1	C	1	2	N	—	—	—	F1	N	300[4,5]	42	24	24
520-2	Ap,SP	375	.76	430	.72	25,000	A	1	—	—	R	1	C	1	2	N	—	—	—	F1	N	325[4,5]	58	25	25
520-4	Ap	400	.74	475	.71	26,000	A	1	—	—	R	1	C	1	2	N	—	—	—	F1	N	325[4,5]	69	25	25
520-6,8	Ap,SP	500	.67	550	.65	26,000	A	1	—	—	R	1	C	1	2	N	—	—	—	F1	N	250[4,5]	58	25	25
520-9	SP	350	.78	400	—	26,000	A	1	—	—	R	1	C	1	2	N	—	—	—	F1	N	325[4,5]	58	25	25

Footnotes: [1]-SP,Au,G,M,O,P,W; [2]-Ap,SP; [3]-ahp; [4]-a; [5]-g

Bristol Siddeley Engines Ltd., Filton, Bristol, England

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
BS75	Ab	NA	NA	7350[3]	.50	NA	A	NA	NA	NA	A	NA	A	NA	NA	N	—	—	—	AK	N	NA	89	NA	NA
705[1]	Ap	3520[3]	.61	3850[3]	.59	11,111	A	2	—	—	A	2	A-C	12-1	8	N	—	—	—	AK	N	3005[5]	123	44	48
761[1]	Ap	3915[3]	.60	4195[3]	.59	11,593	A	2	—	—	A	2	A-C	12-1	8	N	—	—	—	AK	N	2900[5]	123	44	52
765[1]	Ap	4165[3]	.59	4415[3]	.59	11,593	A	2	—	—	A	2	A-C	12-1	8	N	—	—	—	AK	N	2900[5]	123	44	52
1277[1]	G	2.84[4]	.60	4250	.60	11,600	A	2	—	—	A	2	A-C	12-1	8	N	—	—	—	F1	N	3050[5]	100	52	49
1270[1]	M	3400	.64	4250	.60	11,600	A	2	—	—	A	2	A-C	12-1	8	N	—	—	—	F1	N	2885[5]	112	52	49

Footnotes: [1]-Proteus; [2]-ehp; [3]-lbt; [4]-MW; [5]-a,g

Brown Boveri and Co., Ltd., Baden, Switzerland

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
7 (1200°F)	G,SP	2.9MW	.93	4150	.93	5350	A	6	A	14	—	—	—	—	1	N	—	Op	—	F1	2	280,500[1]	610	295	280
7 (1200°F)	G,SP	3.0MW	.76	4300	.76	5350	A	6	A	14	—	—	—	—	1	N	—	Op	—	Fg	N	280,500[1]	610	295	280
8 (1200°F)	G,SP	4.0MW	.85	5720	.85	4750	A	7	A	17	—	—	—	—	1	N	—	Op	—	F1	2	317,000[1]	600	295	280
8 (1200°F)	G,SP	4.13MW	.70	5900	.70	4750	A	7	A	17	—	—	—	—	1	N	—	Op	—	Fg	N	317,000[1]	600	295	280
8 (1380°F)	G,BF	5.96MW	.61	11,450	.54	4750	A	7	A	17	—	—	—	—	1	N	—	Op	—	Fg	N	348,000[1]	575	295	280
9 (1380°F)	G,BF	8.65MW	.60	15,800	.54	4230	A	7	A	17	—	—	—	—	1	N	—	Op	—	Fg	N	460,000[1]	700	295	280
10 (1200°F)	G,SP	6.2MW	.79	14,300	.66	3600	A	7	A	17	—	—	—	—	1	N	—	Op	—	F1	2	354,000[1]	600	236	280
10 (1200°F)	G,SP	6.4MW	.65	14,300	.54	3600	A	7	A	17	—	—	—	—	1	N	—	Op	—	Fg	N	354,000[1]	600	236	280
10 (1380°F)	G,BF	10.9MW	.59	20,000	.53	3600	A	NA	A	NA	—	—	—	—	1	N	—	Op	—	Fg	N	507,000[1]	730	280	430
11 (1380°F)	G,BF	14.0MW	.60	24,300	.55	3340	A	NA	A	NA	—	—	—	—	1	N	—	Op	—	Fg	N	640,000[1]	850	320	430
12 (1200°F)	G,SP	11.0MW	.74	24,300	.62	3000	A	7	A	20	—	—	—	—	1	N	—	Op	—	F1	2	600,000[1]	730	280	430
12 (1200°F)	G,SP	11.5MW	.61	24,300	.52	3000	A	7	A	20	—	—	—	—	1	N	—	Op	—	Fg	N	600,000[1]	730	280	430
12 (1380°F)	G,BF	17.95MW	.58	28,600	.55	3000	A	7	A	17	—	—	—	—	1	N	—	Op	—	Fg	N	660,000[1]	800	320	430
12/8 (1200°F)	G,SP	21.0MW	.64	43,000	.53	3000	A	7	A	17	A	5	A	14	1	N	AW	Op	—	F1	2	1,033,000[1]	800	445	450
12/8 (1200°F)	G,SP	22.2MW	.52	43,000	.44	3000	A	7	A	17	A	5	A	14	1	N	AW	Op	—	Fg	N	1,033,000[1]	800	445	450
Mobile	G,P	6.2MW	.75	8900	.75	3600	A	7	A	17	—	—	—	—	1	N	—	—	—	F1	2	520,000[1]	1780	130	185
Loco	L	2200	NA	2200	NA	5200	A	7	A	17	—	—	—	—	1	N	—	S	—	F1	2	203,000[1]	755	66	160

Footnotes: [1]-Weights and dimensions include all accessories, reduction gear and **generator** ready to operate. 3600 rpm and below no gear; [2]-Treatment, if any, depends on type fuel; F1 in this case means "heavy residual oil", Fg-gas or distillate. All units at 68°F amb. & 29" Hg, cooling water 59°F.

John Brown & Co., (Clydebank) Ltd., Clydebank, Scotland

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
GT.4	G	2.2MW	2.07	3140	2.07	12,750	A	5	C	2	—	—	—	—	1	N	AW[1]	S	CC	Fs[3]	Y	581,160[5]	763	906	402
GT.5	G	2.0MW	1.81	2870	1.81	12,750	A	5	C	2	—	—	—	—	1	N	AW[2]	S	CC	Fs[4]	Y	521,920[5]	756	498	439

Footnotes: [1]-Cooling water 60°F; [2]-Cooling water 70°F; [3]-Peat is pulverized and pre-dried in flue gas drier; [4]-Slurry is pulverized and dried in high-speed mill; [5]-a,g,h

Cantieri del Tirreno, Genoa, Italy

(Clark Bros. Company, licensee to build units 302, 302R, 305 and 305R)

Chrysler Corp., Detroit, Michigan

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
A-249-2A	Au[1]	140[2]	0.51	160	0.51	45,730	A	1	—	NP	A	1	C	1	1	N	—	Rt	—	F1	N	455[3]	36	35	27

Footnotes: [1]-SP,Au,APU,G,GC,M,O,P,W; [2]-at 85°F amb; [3]-a,g,h

Clark Bros. Co., Division of Dresser Operations, Inc., Olean, N. Y.

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
302	G[1]	9300[2]	.60	11,620[2]	.55	3600	A	2	—	—	A	2	A	13	1	N	N	Op	N	Fg,Fl	Y	175,000[4]	571	124	171
302R	G[1]	8550[2]	.49	10,700[2]	.44	3600	A	2	—	—	A	2	A	13	1	N	N	S	Op	Fg,Fl	Y	295,000[4]	571	124	171
305	1	8700[2]	.64	10,880[2]	.59	5000	A	1	—	—	A	2	A	13	1	N	N	Op	N	Fg,Fl	Y	175,000[4]	571	124	171
305R	1	8000[2]	.52	10,000[2]	.47	5000	A	1	—	—	A	2	A	13	1	N	N	S	Op	Fg,Fl	Y	295,000[4]	571	124	171
305S	G[1]	9000[2]	.61	11,250[2]	.54	5000	A	3	A	13	—	—	—	—	2	N	N	Op	N	Fg,Fl	Y	85,000[4]	363	130	190
305SR	G[1]	8270[2]	.49	10,300[2]	.44	5000	A	3	A	13	—	—	—	—	2	N	N	S	Op	Fg,Fl	Y	205,000[4]	363	130	190
306	G[1]	10,000[2]	.60	12,500[2]	.55	3600	A	2	—	—	A	2	A	15	1	N	N	Op	N	Fg,Fl	Y	180,000[4]	581	124	171
306R	G[1]	9200[2]	.49	11,500[2]	.44	3600	A	2	—	—	A	2	A	15	1	N	N	S	Op	Fg,Fl	Y	300,000[4]	581	124	171
307	1	9500[2]	.64	11,880[2]	.59	5000	A	1	—	—	A	2	A	15	1	N	N	Op	N	Fg,Fl	Y	180,000[4]	581	124	171
307R	1	8750[2]	.52	10,930[2]	.47	5000	A	1	—	—	A	2	A	15	1	N	N	S	Op	Fg,Fl	Y	300,000[4]	581	124	171

Footnotes: [1]-AC,E,GC,M,O,P,Pr,W; [2]-at 80°F amb; [3]-at 50°F amb; [4]-a,hw

Continental Aviation and Engineering Corp., Detroit, Michigan

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
356-7A	Aj	1375[1]	1.08	1700[1]	1.10	22,000	—	—	—	—	A	1	A-C	1-1	1	N	—	—	—	—	—	335[3]	47	23	23
CJ69-1025	Aj	880[1]	1.12	1025[1]	1.14	21,700	—	—	—	—	A	1	C	1	1	N	—	—	—	—	—	364[3]	50	23	23
217-6A	Ap	405	.70	500	.67	34,000	A	1	—	—	A	2	A-C	1-1	1	N	—	—	—	—	—	235[3,4]	49	20	20
217-5A	SP	405	.70	500	.67	34,000	A	1	—	—	A	2	A-C	1-1	1	N	—	—	—	—	—	210[3,4]	44	20	20
C-141	AS	—	—	191[2]	1.50	35,000	—	—	—	—	A	2	C	1	1	N	—	—	—	—	—	197[3]	49	25	26

Footnotes: [1]-lbt; [2]-ahp; [3]-a; [4]-g

Cooper-Bessemer Corp., Mount Vernon, Ohio

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
RT-248	GC[1]	10,500[2]	.53	13,300[2]	.53	5000	A	2	—	—	—	—	—	—	—	N	—	Op	—	Fl,Fg	N	29,000	260	156	167
							A	2	A	9	A	1	A	7	8										

Footnotes: [1]-G,L,M,Pr; [2]-at 80°F amb; [3]-at 45°F amb Note: Second line of data under "Power Shaft" and "Comp. Shaft" are for GG3C Pratt & Whitney Gas Generator used with C-B power turbine

Daimler-Benz AG, Stuttgart, West Germany

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
1	P,Au	300	.82	—	—	21,000	A	1	—	—	A	2	A-C	1-1	1	—	—	N	—	Fl	N	—[1]	40	34	30
2	P,Au	260	NP	—	—	21,000	A	1	—	—	A	2	A-C	1-1	1	—	—	Rt	—	Fl	N	—	—	—	—

Footnote: [2]-g

DeLaval Ljungstrom Turbine Co., Finspang, Sweden

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
GT35	G[1]	7.5MW[2]	.63	13,400[2]	.57	3000 3600	A A	3 2	— A	— 10	— A	— 1	— A	— 10	7	N	—	—	—	Fl,Fg	Ad	200,000[4]	700	200	150
GT120	G	30MW[2]	.59	53,600[2]	.53	3000 3600	A A	3 2	— A	— 10	— A	— 2	— A	— 13	2	N	AW	—	—	Fl,Fg	Ad	900,000[4]	1200	600	500

Footnotes: [1]-AC,GC; [2]-at 80°F amb; [3]-at 25°F amb; [4]-a,h

English Electric Co., Ltd., London, and Whetstone, England

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
NEL.7[1]	S	—	—	3500[7]	.63	12,500	A	3	A	10	—	—	A	9	6	N	—	—	—	Fl	N	2435[9,10]	159	36	36
504[1]	Ap	2910[7]	.64	3500[7]	.62	12,500	A	3	A	10	—	—	—	—	6	N	—	—	—	Fl	N	1820[9,10]	116	36	36
512[2]	Ap	1280	.70	1640	.67	18,000	A	1	—	—	A	2	A	11	6	N	—	—	—	Fl	N	675[9,10]	72	30	25
EM27	G[4]	2630[6]	.81	2870	.80	7000	A	2	—	—	A	2	A-C	6-1	2	N	—	Op	—	Fl,Fg	N	21,000[9]	228	99	138
EM27R	P,L[5]	2370[6]	.63	2585	.61	7000	A	2	—	—	A	2	A-C	6-1	2	N	—	S	Op	Fl,Fg	N	31,000[9,11]	228	99	126
EM85	G[4,5]	8000[6]	.65	8930	.64	4900	A	2	—	—	A	2	A	12	1	N	—	Op	—	Fl,Fg	N	71,500[9]	273	108	186
B20MW	G	27,600[6]	.53	33,000	—	3000	A	6	—	—	A	2	A-C	6-1	1	N	AW[8]	Op	—	Fl,Fg	N	395,000[9]	780	384	372
							A	6	A	14	A	2	A-C	6-1	1	N									

Footnotes: [1]-Napier, Eland; [2]-Ap and AS at same time; [3]-Napier, Gazelle; [4]-O,GC,W; [5]-M,AC; [6]-at 80°F amb; [7]-ehp; [8]-Cooling water 68°F; [9]-a; [10]-g; [11]-h

Escher Wyss Ltd., Zurich, Switzerland

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
2	G[1]	2MW	.52	3420	.52	12,750	A	5	C	3	—	—	—	—	1	N	AW[2]	Op	CC	All	Adv	[3]	[3]	—	—
3	G[1]	3MW	.47	5140	.47	11,700	A	6	C	3	—	—	—	—	1	N	AW[2]	Op	CC	All	Adv	[3]	[3]	—	—
6	G[1]	6MW	.46	10,300	.46	8900	A	6	A	16	—	—	—	—	1	N	AW[2]	Op	CC	All	Adv	[3]	[3]	—	—
10	G[1]	10MW	.45	17,200	.45	6600	A	6	A	19	—	—	—	—	1	N	AW[2]	Op	CC	All	Adv	[3]	[3]	—	—
15	G[1]	15MW	.43	25,700	.43	6500	A	6	A	16	—	—	—	—	1	N	AW[2]	Op	CC	All	Adv	[3]	[3]	—	—
25	G	25MW	.40	43,000	.40	3000	A	7	A	14	A	3	A	9	2	N	2AW[2]	Op	CC	All	Adv	[3]	[3]	—	—

Footnotes: [1]-AC,GC; [2]-Cooling Water 54°F; [3]-Weights and dimensions depend on fuel (FL,Fg,Fs or Fn) and local conditions

Franco Tosi S.P.A., Legnano, Italy

(Associated Electrical Industries licensee building all A.E.I. designs of gas turbines (except marine) up to 6000 hp.)

General Electric Co., Lynn, Cincinnati and Schenectady, U.S.A.

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
CJ-805-3[1]	Aj	9800[4]	.76	11,200[4]	.83	7684	—	—	—	—	A	3	A	17	10	N	—	—	—	AK	N	2800[9]	111	32	45
CJ-805-3B[1]	Aj	—	—	11,650[4]	.83	7460	—	—	—	—	A	3	A	17	10	N	—	—	—	AK	N	2850[9]	111	32	45
CJ-610[2]	Aj	858[4,5]	1.14	2700[4]	.97	—	—	—	—	—	A	2	A	8	1	N	—	—	—	AK	N	355[9]	40	18	18
CF700-2B[2]	Aa	900[4,5]	.95	4200[4]	.68	—	A	1	A	1	A	2	A	8	1	N	—	—	—	AK	N	615[9]	64	34	34
CJ-805-23[1]	Aa	14,100[4]	.54	15,850[4]	.58	—	A	1	A	1	A	3	A	17	10	N	—	—	—	AK	N	3730[9]	130	54	54
CJ-805-23C[1]	Aa	14,400[4]	.54	16,100[4]	.58	—	A	1	A	1	A	3	A	17	10	N	—	—	—	AK	N	3770[9]	130	54	54
T64-4,8[3]	Ap	2230[6]	.50	2700[6]	.49	13,600	A	2	—	—	A	2	A	14	1	N	—	—	—	AK	N	1060[10]	113	29	46
CT58-100[3]	SP	900	.67	1050	.64	19,500	A	1	—	—	A	2	A	10	1	N	—	—	—	Fl	N	280[9]	55	16	16
CT58-110[3]	SP	1050	.64	1250	.61	19,500	A	1	—	—	A	2	A	10	1	N	—	—	—	Fl	N	295[9]	55	16	16
720[3]	I,M	1000[7]	.66	1000[7]	.66	19,500	A	1	—	—	A	2	A	10	1	N	—	—	—	Fl	N	320[9]	55	19	20
722[3]	I	1000[7]	.58	1000[7]	.58	19,500	A	1	—	—	A	2	A	10	1	N	—	—	—	Fg	N	320[9]	55	19	20
T64-2,6[3]	SP	2235	.50	2650	.50	13,600	A	2	—	—	A	2	A	14	1	N	—	—	—	Fl	N	854[9]	91	24	30
RC-2S[3]	SP,G	6700[7]	.52	8900[7]	—	5400	A	1	—	—	A	1	A	14	6	N	—	S	—	Fg,Fl	—[8]	120,000[9]	410	222	93
RC-1S[3]	SP,G	7350[7]	.51	9700[7]	—	6900	A	2	A	15	—	—	—	—	6	N	—	S	—	Fg,Fl	—[8]	112,000[9]	410	258	93
RC-2S[3]	SP,G	7600[7]	.49	10,000[7]	—	5400	A	1	—	—	A	1	A	14	6	N	—	S	—	Fg,Fl	—[8]	120,000[9]	410	258	93
SC-1S[3]	SP,G	7750[7]	.66	10,000[7]	—	6900	A	2	A	15	—	—	—	—	6	N	—	Op	—	Fg,Fl	—[8]	100,000[9]	403	125	91
SC-2S[3]	SP,G	7850[7]	.68	10,350[7]	—	5400	A	1	—	—	A	1	A	14	6	N	—	Op	—	Fg,Fl	—[8]	110,000[9]	410	125	91
SC-1S[3]	G,PL	6.3MW[7]	.63	12,100[7]	—	6900	A	2	A	15	—	—	—	—	6	N	—	Op	—	Fg,Fl	—[8]	100,000[9]	380	125	91
SC-1S[3]	SP,G	12,000[7]	.63	16,300[7]	—	4860	A	2	A	15	—	—	—	—	10	N	—	Op	—	Fg,Fl	—[8]	130,000[9]	433	126	110
SC-1S[3]	SP,G	14,500[7]	.59	19,700[7]	—	4860	A	2	A	16	—	—	—	—	10	N	—	Op	—	Fg,Fl	—[8]	130,000[9]	433	126	110

240[5]	M,SP	18,300	.48	20,500	.47	6050	A	1	—	—	A	3	A	17	10	N	—	Op	—	F1	N	6000[9]	290	65	95
SC-1S[5]	G,PL	11.0MW[7]	.59	21,500[7]	—	4860	A	2	A	16	—	—	—	—	10	N	—	Op	—	Fg,F1	—[8]	130,000[9]	433	126	110
RC-1S[5]	SP,G	22,500[7]	.47	33,300[7]	—	3600	A	2	A	16	—	—	—	—	8	N	—	S	—	Fg,F1	—[8]	310,000[9]	489	186	108
SC-1S[5]	SP,G	24,000[7]	.60	33,800[7]	—	3600	A	2	A	16	—	—	—	—	16	N	—	Op	—	Fg,F1	—[8]	284,000[9]	489	186	108
SC-1S[5]	G,PL	20.5MW[7]	.56	40,000[7]	—	3600	A	2	A	16	—	—	—	—	16	N	—	Op	—	Fg,F1	—[8]	284,000[9]	489	186	108
SC-1S[5]	SP,G	33,000[7]	.66	46,800[7]	—	3290	A	2	A	15	—	—	—	—	12	N	—	Op	—	Fg,F1	—[8]	374,000[9]	501	208	130

Footnotes: [1]-Built at Cincinnati; [2]-built at Lynn; [3]-built at Schenectady; [4]-lbt; [5]-rating .8 Mach at 36,000-ft Alt.; [6]-ehp; [7]-at 80°F amb; [8]-heavy oils generally require treatment; [9]-a; [10]-a,g

Hawker Siddeley Brush Turbines, Ltd., Gloucester, England

(Clark Bros. Company, licensee to build units 302, 302R, 305 and 305R)

Ishikanajima Shibaura Turbine Co., Tokyo, Japan

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT: TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT: TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED: At Comp.	Ex. Heat	OTHER	FUEL: TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
1	G	2200	1.0	2200	1.0	5500	A	4	A	20	—	—	—	—	2	N	—	N	—	F1	N	15,400	177	79	63
2	G	2.0MW	.76	2850	.76	5544	A	3	A	8	A	3	A	9	1	N	—	S	—	F1	N	125,400[2]	685	119	201
3	G	4.9MW[1]	.60	7000[2]	.60	3600	A	4	A	16	—	—	—	—	1	N	—	S	—	Fg	N	195,800[2]	703	296	187

Footnotes: [1]-at 95°F amb; [2]-a,g,h; [3]-a,h

B. C. Jet Engines Ltd., Vancouver, Canada

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT: TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT: TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED: At Comp.	Ex. Heat	OTHER	FUEL: TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
1	G,H[1]	—	—	350	NP	28,000	A	2	C	1	—	—	—	—	1	N	—	—	—	F1	—	110	36	18	18

Footnote: [1]-APU,AC,AS,M,P,W

Klockner-Humboldt-Deutz AG, Oberursel, Germany

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT: TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT: TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED: At Comp.	Ex. Heat	OTHER	FUEL: TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
T16	P[1]	80[2]	1.32	80[2]	1.32	50,000	R	1	C	1	NP	—	—	—	1	N	—	—	—	F1	N	139[2]	30	20	25

Footnotes: [1]-APU,G,W; [2]-at 68°F amb; [3]-a,g

Lycoming Division of Avco Corp., Stratford, Conn.

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT: TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT: TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED: At Comp.	Ex. Heat	OTHER	FUEL: TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
LTC1B-2,3	H,SP	770	.80	860	.77	21,500	A	1	—	—	A	1	A-C	5-1	1	—	—	—	—	F1	—	484[1]	48	23	25
LTC1F-1	Ap	825	.71	960	.68	21,300	A	1	—	—	A	1	A-C	5-1	1	—	—	—	—	F1	—	530[1]	59	23	25
LTC1F-2	Ap	900	.69	1100	.67	21,300	A	1	—	—	A	1	A-C	5-1	1	—	—	—	—	F1	—	522[1]	59	23	25
LTC1K-1	H,SP	825	.71	960	.69	21,300	A	1	—	—	A	1	A-C	5-1	1	—	—	—	—	F1	—	485[1]	48	23	25
LTC1K-2	H,SP	900	.70	1100	.68	21,300	A	1	—	—	A	1	A-C	5-1	1	—	—	—	—	F1	—	485[1]	48	23	25
LTC1N	I,M	700	.71	900	.65	18,900	A	1	—	—	A	2	A-C	5-1	1	—	—	—	—	F1	—	1200[1]	76	26	38
LTC4B-7	H,SP	1850	.66	2200	.62	14,500	A	2	—	—	A	1	A-C	7-1	1	—	—	—	—	F1	—	570[1]	44	25	28

Footnote: [1]-a

Maschinenfabrik Augsburg-Nuernberg A.G., (MAN), Augsburg, Germany

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	Ex. Heat	OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
H1	G	7500	.63	8500	.63	3000	A	2	—	NP	A	4	A	16	1	—	—	St	Op	Fl,Fg	—	—	—	—	—

D. Napier & Son Ltd., London, England

(See English Electric Company, Ltd.)

Nuove Reggiane, Reggio Emilia, Italy

(Associated Electrical Industries licensee building marine gas turbines of A.E.I. design up to 6000 hp.)

Oerlikon Engineering Co., Zurich, Switzerland

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	Ex. Heat	OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
MFO 1	G	980	.72	(68°F)	—	5274	A	5	C	3	—	—	—	—	1	N	—	Sa	—	Fl	N	176,000	417	70	44

Orenda Engines Ltd., Toronto, Canada

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	Ex. Heat	OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
OT-F-2	GC	6700[1]	.74	10,600[2]	.69	7500	A	1	—	—	A	2	A	10	8	N	—	—	—	Fl,Fg	N	35,000[3]	255	106	90
OT-F-2R	GC	6200[1]	.50	10,500[2]	.41	7500	A	1	—	—	A	2	A	10	8	N	—	S	—	Fl,Fg	N	35,000[3]	255	106	90
OT-C-2	G	6700[1]	.74	10,600[2]	.65	7500	A	1	—	—	A	2	A	10	8	N	—	—	—	Fl,Fg	N	35,000[3]	220	106	90
OT-C-2R	G	6200[1]	.50	10,500[2]	.41	7500	A	1	—	—	A	2	A	10	8	N	—	S	—	Fl,Fg	N	35,000[3]	220	106	90
OT-F-3-10	G,GC	6600[1]	.75	10,000[2]	.70	7500	A	1	—	—	A	2	A	10	6	N	—	—	—	Fl,Fg	N	13,000[3]	220	67	86
OT-F-3-11	G,GC	6700[1]	.74	10,600[2]	.69	7500	A	1	—	—	A	2	A	10	6	N	—	—	—	Fl,Fg	N	13,000[3]	196	67	86
OT-F-6	M	8300	.73	9000	.72	7500	A	1	—	—	A	2	A	10	6	N	—	—	—	Fl,Fg	N	4424[3]	196	67	86

Footnotes: [1]-at 80°F amb; [2]-at —40°F amb; [3]-a

C. A. Parsons and Co., Ltd., Newcastle upon Tyne, England

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	Ex. Heat	OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
Air Bleed	AS	2710[2]	.91	—	—	—	—	—	—	—	A	6	A	14	2	N	—	—	—	Fl	N	200,000[4]	558	636	324
2.5MW	[1]	3580[3]	.55	—	—	3000	A	2	—	—	A	2	A	12	2	N	—	S	—	Fl,Fg	N	139,000[4]	480	219	207
6.5MW	[1]	9300[3]	.53	—	—	3000	A	2	—	—	A	2	A	13	2	N	—	S	—	Fl,Fg	N	290,000[4]	828	282	282
10MW	G	14,300	.51	—	—	3000	A	5	A	13	A	3	A	11	4	N	AW	S,Sh	Sh	Fl	N	850,000[4]	1397	756	489
15MW	G	21,430	.51	—	—	3000	A	7	A	13	A A	5 5	A A	8 10	2	Y	AW	S	—	Fl	N	1,000,000[4]	1019	900	438

Footnotes: [1]-G,GC,O,W; [2]-ehp; [3]-at 80°F amb; [4]-a,h

Pratt & Whitney Aircraft, East Hartford, Conn.

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
JT3C-6	Aj	9500[1]	.76	13,500[1]	.77	[3]	A	2	A	9	A	1	A	7	8	N	—	—	—	AK	N	4234	[12]	41	49
JT3C-7	Aj	10,000[1]	.77	12,000[1]	.78	[3]	A	2	A	9	A	1	A	7	8	N	—	—	—	AK	N	3495	[12]	39	47
JT3C-12	Aj	11,500[1]	.78	13,000[1]	.82	[3]	A	2	A	9	A	1	A	7	8	N	—	—	—	AK	N	3550	[12]	39	47
JT3D-1	Af	14,500[1]	.50	17,000[1]	.52	[3]	A	2	A	9	A	1	A	6	8	N	—	—	—	AK	N	4065	[12]	53	56
JT3D-3	Af	16,400[1]	.51	18,000[1]	.53	[3]	A	2	A	9	A	1	A	6	8	N	—	—	—	AK	N	4170	[12]	53	56
JT3D-5A	Af	18,000[1]	.53	21,000[1]	.59	[3]	A	2	A	9	A	1	A	6	8	N	—	—	—	AK	N	4490	[12]	54	56
JT4A-10	Aj	13,000[1]	.74	16,800[1]	.81	[3]	A	2	A	8	A	1	A	7	8	N	—	—	—	AK	N	4845	[12]	43	51
JT4A-12	Aj	14,900[1]	.77	17,500[1]	.84	[3]	A	2	A	8	A	1	A	7	8	N	—	—	—	AK	N	4895	[12]	43	51
JT12A-6	Aj	2300[1]	.89	3000[1]	.96	—	—	—	—	—	A	2	A	9	8	N	—	—	—	AK	N	436	78	22	29
JT12A-8	Aj	2650[1]	.91	3300[1]	.99	—	—	—	—	—	A	2	A	9	8	N	—	—	—	AK	N	465	78	22	29
PT2G-7	Ap	5650[2]	.62	7500[2]	.55	11,000	A	3	A	12	—	—	—	—	9	N	—	—	—	F1	N	2950[11]	155	34	46
PT6A-1	Ap	400[2]	.74	400[2]	.72	33,000	A	1	—	—	A	1	A-C	3-1	1	N	—	—	—	F1	N	250[11]	66	19	19
PT6A-3	Ap	400[2]	.73	500[2]	.69	33,000	A	1	—	—	A	1	A-C	3-1	1	N	—	—	—	F1	N	250[11]	66	19	19
PT6B-3	SP	400	.74	500	.70	33,000	A	1	—	—	A	1	A-C	3-1	1	N	—	—	—	F1	N	225[11]	58	19	19
ST6	[5]	350[2]	—	—	—	—	A	1	—	—	A	1	A-C	3-1	1	N	—	—	—	F1	N	225[11]	58	19	19
GG12[2]	AS,GG	2500[6,7]	—	—	—	—	—	—	—	—	A	2	A	9	8	N	—	—	—	F1	N	436	78	22	29
ST2	[5]	4600[2]	—	—	—	—	A	3	A	12	—	—	—	—	9	N	—	—	—	F1	N	2670[11]	155	34	46
GG8[2,4]	AS,GG	7000[6,8]	—	—	—	—	A	1	A	5	A	1	A	7	8	N	—	—	—	F1	N	2200	116	31	40
GG3[2,4]	AS,GG	10,500[6,9]	—	—	—	—	A	2	A	9	A	1	A	7	8	N	—	—	—	F1,Fg	N	4000	133	39	47
GG4[2,4]	AS,GG	15,000[6,10]	—	—	—	—	A	2	A	8	A	1	A	7	8	N	—	—	—	F1	N	5000	144	43	51

Footnotes: [1]-lbt; [2]-ehp; [3]-Dual rotor units show low-compression shaft under "Power Shaft" and high-compression shaft under "Comp. Shaft". Same applies GG3, GG4 and GG8; [4]-With integral free turbine, new model nos. FT12, FT8, FT3, FT4 and "use" [5]; [5]-SP,O,GC,G,M; [6]-at 80°F amb; [7]-air flow 45 lb/s; [8]-air flow 96 lb/s; [9]-air flow 147 lb/s; [10]-air flow 218 lb/s; [11]-g; [12]-tailpipe tailored to suit

Rolls-Royce Ltd., Derby, England

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
RA29/1	Aj	9125[1]	.73	10,500[1]	.77	7650	—	—	—	—	A	3	A	16	8	N	—	—	—	AK	—	3308[4]	126	39	39
RA29/3	Aj	9500[1]	.74	11,400[1]	.80	7750	—	—	—	—	A	3	A	16	8	N	—	—	—	AK	—	3327[4]	126	39	39
RA29/6	Aj	10,820[1]	.72	12,725[1]	.72	7850	—	—	—	—	A	3	A	17	8	N	—	—	—	AK	—	3471[4]	134	39	39
RCo.12	Ab	14,625[1]	.69	17,500[1]	.72	9590	A	2	A	7	A	1	A	9	10	N	—	—	—	AK	—	4542[4]	136	42	42
RCo.15	Ab	15,000[1]	.66	18,500[1]	.70	9500	A	2	A	7	A	1	A	9	10	N	—	—	—	AK	—	4582[4]	136	42	42
RCo.42	Ab	16,500[1]	.59	20,250[1]	.62	9575	A	2	A	NA	A	1	A	NA	10	N	—	—	—	AK	—	5001[4]	150	48	48
RB 141	Ab	14,100[1]	.58	15,000[1]	.59	9725	A	NA	A	5	A	NA	A	11	10	N	—	—	—	AK	—	3613[4]	135	42	42
RB 163	Ab	9450[1]	.54	9850[1]	.56	12,260	A	2	A	4	A	2	A	12	10	N	—	—	—	AK	—	2200[4]	110	37	37
RDa.6-510	Ap	1432[2]	.75	1535[2]	.71	14,000	A	2	C	2	—	—	—	—	7	N	—	—	—	AK	—	1106[5]	98	38	38
RDa.6-511	Ap	1650[2]	.72	1650[2]	.72	14,500	A	2	C	2	—	—	—	—	7	N	—	—	—	AK	—	1106[5]	98	38	38
RDa.7-520	Ap	1655[2]	.73	1815[2]	.72	15,000	A	3	C	2	—	—	—	—	7	N	—	—	—	AK	—	1207[5]	98	38	38
RDa.7/1-525	Ap	1750[2]	.72	1910[2]	.70	15,000	A	3	C	2	—	—	—	—	7	N	—	—	—	AK	—	1227[5]	98	38	38
RDa.7/2[2]	Ap	2020[2]	.69	2020[2]	.69	15,000	A	3	C	2	—	—	—	—	7	N	—	—	—	AK	—	1227[5]	98	38	38
RDa.10	Ap	2555[2]	.66	2555[2]	.66	15,000	A	3	C	2	—	—	—	—	7	N	—	—	—	AK	—	1376[5]	98	38	38
RDa.10/1	Ap	2555[2]	.66	3030[2]	NA	15,000	A	3	C	2	—	—	—	—	7	N	—	—	—	AK	—	1376[5]	98	38	38
RTy.1	Ap	4190[2]	.50	4785[2]	.50	15,250	A	3	A	6	A	1	A	9	10	N	—	—	—	AK	—	2275[5]	109	44	44
RTy.11	Ap	4670[2]	.48	5325[2]	.48	15,250	A	3	A	6	A	1	A	9	10	N	—	—	—	AK	—	2275[5]	109	44	44
RTy.12	Ap	5050[2]	.47	5500[2]	.46	15,250	A	3	A	6	A	1	A	9	10	N	—	—	—	AK	—	2177[5]	109	44	44

Footnotes: [1]-lbt; [2]-ehp; [3]-Model Nos. RDa.7/2-526 to 531; [4]-a; [5]-ag Note: Avon = RA; Conway = RCo. and RB; Dart = RDa.; Tyne = RTy.

Rover Gas Turbines Ltd. Solihull, Warwickshire, England

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	Ex. Heat	OTHER	FUEL TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
IS/60	—[1]	60	1.45	70	—	46,000	A	1	C	1	—	—	—	—	1	—	—	—	—	Fl	—	133[2]	19	19	24
IS/90	—[1]	90	1.38	100	—	46,000	A	1	C	1	—	—	—	—	1	—	—	—	—	Fl	—	133[2]	19	19	24

Footnotes: [1]-Ap,APU,G,I,M,P; [2]-a,g

Ruston & Hornsby Ltd., Lincoln, England

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	Ex. Heat	OTHER	FUEL TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
TA	AS[1]	1260[2]	.88	—	—	6000	A	2	—	—	A	2	A	13	1	N	N	Op	Op	Fl,Fg	Ad	13,500[3]	186	84	78
TE	—[1]	430[2]	1.22	—	—	19,250	A	3	C	1	—	—	—	—	1	N	N	Op	Op	Fl,Fg	N	3696[3]	92	57	73

Footnotes: [1]-AC,G,GC,M,O,P,Pr,W; [2]-at 80°F amb; [3]-a,g

Siemens Schuckertwerke AG., (SSW), Mulheim-Ruhr, Germany

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	Ex. Heat	OTHER	FUEL TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
VM3	G	3.0MW	.55	4300	.55	3000	A	2	—	—	A	3	A	12	1	N	—	S	Op	Fl	N	85,000[2]	400	154	83
VM5	BF	7580ehp	99.7[1]	—	—	3962	A	6	A	14	—	—	—	—	1	N	—	S	Op	Fg	N	146,000	540	126	71
VM8	G	21.0MW	9.91[2]	30,000	9.91	3000	A	6	A	17	—	—	—	—	1	N	—	S	Sh	Fg	N	318,000[2]	650	157	79

Footnotes: [1]-SFC/hp hr, LHV-107 Btu/SFC; [2]-LHV-917 Btu/SFC; [3]-g

Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, (SNECMA), Paris, France

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	Ex. Heat	OTHER	FUEL TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
M33[1]	G[3]	12,000	.63	13,600	.60	4700	A	2	—	—	A	2	A	10	1	N	—	N	—	Fl	—	19,800	233	118	110
M34[2]	G[3]	12,000	.63	13,200	.62	4700	A	2	—	—	A	2	A	10	1	N	—	N	—	Fl	—	21,340	275	118	110

Footnotes: [1]-Rated for 10,000 hours between overhauls; [2]-Rated for 50,000 hours between overhauls; [3]-APU

Solar Aircraft Co., San Diego, California

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	Ex. Heat	OTHER	FUEL TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
T-41M	G,APU	50	2.20	60	2.10	38,250	R	1	C	1	—	—	—	—	1	N	—	Sa	—	Fl	N	100[4]	28	17	24
T-45M	[1]	50	2.20	60	2.10	40,300	R	1	C	1	—	—	—	—	1	N	—	—	—	Fl	N	90[4]	25	17	22
T-150M	APU[1]	350	.98	390	.96	35,100	R	1	C	1	NP	—	—	—	1	N	—	—	—	Fl	N	195[4]	37	24	27
YT-62	Ap	55	1.30[4]	—	—	56,700	R	1	C	1	—	—	—	—	1	N	—	—	—	Fl	N	55[4]	16	13	25
T-62T	[1,5]	80	1.10	—	—	56,700	R	1	C	1	—	—	—	—	1	N	—	—	—	Fl	N	60[4]	26	14	17
T-300J	AS,APU	250[5]	1.37	300[5]	1.32	20,600	—	—	—	—	A	3	A	10	1	N	—	—	—	Fl	N	810[4]	75	32	42
T-520J	G	520	.90	600	.85	20,600	A	3	A	10	—	—	—	—	1	N	—	—	—	Fl,Fg	N	900[4]	75	32	42
T-522J	M	520	.90	600	.85	20,600	A	1	—	—	A	2	A	10	1	N	—	—	—	Fl,Fg	N	1000[4]	91	32	42
T-1000S	[6]	1080	.63	1250	.60	22,000	A	1	—	—	A	2	A	8	1	N	—	—	—	Fl,Fg	N	950[4]	68	45	44
T-1020S	G,AS	1080	.63	1250	.60	22,000	A	3	A	8	—	—	—	—	1	N	—	—	—	Fl,Fg	N	950[4]	68	45	44

Footnotes: [1]-AS,P,W,G; [2]-M,Pr,APU; [3]-M,O,W,GC; [4]-at 100°F; [5]-ahp; [6]-a,g Note: Mars = T-41M, 45M, 150M; Titan = YT-62, T-62T; Jupiter = T-300J, 520J; Saturn = T-1000S, 1020S

Sulzer Bros. Ltd., Winterthur, Switzerland

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
N53045	APU,G	4500	.75	—	—	7200	A	3	A	10	—	—	—	—	2	N	—	—	—	Fg,Fl	—	38,500[3]	370	240	200
NR53045	APU,G	4100	.50	—	—	7200	A	3	A	10	—	—	—	—	2	N	—	S	—	Fg,Fl	—	250,000[4]	550	280	200
NS63045	[1]	4500	.75	—	—	6060	A	1	—	—	A	2	A	10	2	N	—	—	—	Fg,Fl	—	44,000[3]	350	240	200
NSR63045	[1]	4100	.50	—	—	6060	A	1	—	—	A	2	A	10	2	N	—	S	—	Fg,Fl	—	255,000[4]	550	280	200
N75063	[2]	12,000	.62	—	—	4900	A	6	A	16	—	—	—	—	1	N	—	—	—	Fg,Fl	—	246,000[3]	560	240	270
NR75063	[2]	11,250	.49	—	—	4900	A	6	A	16	—	—	—	—	1	N	—	S	—	Fg,Fl	—	576,000[4]	560	340	270
N95082	[2]	20,000	.62	—	—	3600	A	6	A	16	—	—	—	—	1	N	—	—	—	Fg,Fl	—	412,000[4]	700	300	300
NR95082	[2]	19,000	.49	—	—	3600	A	6	A	16	—	—	—	—	1	N	—	S	—	Fg,Fl	—	1,120,000[4]	700	400	300
N110095	[2]	25,000	.62	—	—	3600	A	6	A	16	—	—	—	—	1	N	—	—	—	Fg,Fl	—	560,000[3]	800	340	300
NR110095	[2]	23,400	.49	—	—	3600	A	6	A	16	—	—	—	—	1	N	—	S	—	Fg,Fl	—	1,620,000[4]	800	400	300
N110095	[2]	28,000	.62	—	—	3000	A	7	A	16	—	—	—	—	1	N	—	—	—	Fg,Fl	—	560,000[3]	800	340	300
NR110095	[2]	26,200	.49	—	—	3000	A	7	A	16	—	—	—	—	1	N	—	S	—	Fg,Fl	—	1,120,000[4]	800	400	300
N1250110	[2]	37,500	.62	—	—	3000	A	6	A	14	—	—	—	—	1	N	—	—	—	Fg,Fl	—	770,000[3]	900	340	300
NR1250110	[2]	35,000	.49	—	—	3000	A	6	A	14	—	—	—	—	1	N	—	S	—	Fg,Fl	—	2,180,000[4]	900	400	300

Footnotes: [1]-AC,GC,O,W; [2]-AC,APU,BF,G,GC,O,W; [3]-a,g; [4]-a,g,h

Turbines Hispano Marep, Paris, France

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
THM-1000	[2]	3060	.70	—	—	6250	A	2	—	—	A	2	A-C	7-1	2	—	—	Op	—	Fl,Fg	N	22,000[3]	238	99	107
THM-1000-RF	[1]	2875	.52	—	—	6250	A	2	—	—	A	2	A-C	7-1	2	—	—	S	—	Fl,Fg	N	22,000[3]	238	99	107
THM-1000-RM	[2]	2800	.61	—	—	6250	A	2	—	—	A	2	A-C	7-1	2	—	—	S	—	Fl,Fg	N	22,000[3]	238	99	107
THM-1100	[2]	4380	.62	—	—	7200	A	2	—	—	A	2	A-C	8-1	2	—	—	Op	—	Fl,Fg	N	22,500[3]	262	99	107
THM-1100-RM	[2]	4010	.57	—	—	7200	A	2	—	—	A	2	A-C	8-1	2	—	—	S	—	Fl,Fg	N	22,500[3]	262	99	107

Footnotes: [1]-AC,G,GC,O,W; [2] = [1] plus L,M,P; [3]-a,g

Turbomeca, Bordes, France

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
Palas	Aj	352[1]	1.17	—	—	34,000	—	—	—	—	A	1	C	1	1	N	—	—	—	AK	—	158	48	16	16
Marbore II	Aj	880[1]	1.15	—	—	22,600	—	—	—	—	A	1	C	1	1	N	—	—	—	AK	—	314	62	23	23
Marbore VI	Aj	1060[1]	1.12	—	—	21,500	—	—	—	—	A	1	C	1	1	N	—	—	—	AK	—	314	56	23	23
Gourdon	Aj	1600[1]	1.04	—	—	21,500	—	—	—	—	A	1	A-C	1-1	1	N	—	—	—	AK	—	375	69	23	23
Gabizo	Aj	2420[1]	1.05	—	—	17,500	—	—	—	—	A	1	A-C	1-1	1	N	—	—	—	AK	—	585	82	27	27
Astazou	Ap,SP	470[2]	.63	—	—	43,000	A	3	A-C	1-1	—	—	—	—	1	N	—	—	—	AK	—	440	69	18	18
Bastan III	Ap	935[2]	.60	—	—	33,500	A	3	A-C	1-1	—	—	—	—	1	N	—	—	—	AK	—	678	75	22	22
Oredon II	Ap	210[2]	.63	—	—	59,000	A	3	A-C	1-1	—	—	—	—	1	N	—	—	—	AK	—	202	60	15	15
Artouste II C	SP	500	.87	—	—	34,000	A	2	C	1	—	—	—	—	1	N	—	—	—	Fl	—	319	57	22	22
Artouste III B	SP	550	.65	—	—	34,000	A	3	A-C	1-1	—	—	—	—	1	N	—	—	—	Fl	—	365	58	22	22
Turmo III B	SP	1000	.61	—	—	34,050	A	3	A-C	1-1	—	—	—	—	1	N	—	—	—	Fl	—	440	66	30	23
Turmo III C	SP	1250	.60	—	—	33,000	A	3	A-C	1-1	—	—	—	—	1	N	—	—	—	Fl	—	489	67	26	26
Palouste IV	AS	[5]	—[5]	—	—	34,000	—	—	—	—	A	2	C	1	1	N	—	—	—	Fl	—	300	48	22	22
Autan II	AS	[6]	—[6]	—	—	34,500	—	—	—	—	A	3	A-C	1-1	1	N	—	—	—	Fl	—	260	54	17	17

Footnotes: [1]-lbt; [2]-ehp; [3]-2.5 lb/s; [4]-3 lb/s; [5]-260 lb/hr; [6]-350 lb/hr

Vector Corporation, Troy, Michigan

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT TURBINE RPM	POWER SHAFT TURBINE Type	POWER SHAFT TURBINE Stages	POWER SHAFT COMP. Type	POWER SHAFT COMP. Stages	COMP. SHAFT TURB. Type	COMP. SHAFT TURB. Stages	COMP. SHAFT COMP. Type	COMP. SHAFT COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED At Comp.	HEAT EXC. USED Ex. Heat	HEAT EXC. USED OTHER	FUEL TYPE	FUEL Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES L	W	H
1	I,G	75	1.36	—	—	48,500	A	1	C	1	NP	—	—	—	1	N	—	N	—	Fl	—	100[2]	40	14	14
2	I,G	75	1.10	—	—	48,500	A	1	C	1	NP	—	—	—	1	N	—	S	—	Fl	—	125[2]	40	14	14

Footnotes: [1]-a,g; [2]-a,g,h

Waukesha Motor Company, Waukesha, Wis. In collaboration with Williams Research Corp.

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT: TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT: TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED: At Comp.	Ex. Heat	OTHER	FUEL: TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES: L	W	H
—	SP[2]	400[3]	NP	600[3]	—	25,270	A	1	—	—	A	1	C	1	1	N	—	—	—	Fl	N	620[3]	50	28	32

Footnotes: [1]-I,M,Au,O; [2]-at 100°F amb; [3]-a

Westinghouse Electric Corp., Lester, Pa.

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT: TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT: TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED: At Comp.	Ex. Heat	OTHER	FUEL: TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES: L	W	H
W-41	—[1]	4200[4]	.68[4]	—[12]	—	8500	A	4	A	14	—	—	—	—	6	N	—	—	—	Fl,Fg	Adv[12]	41,000[14]	240	96	93
W-41R	—[1]	3750	.48	—[12]	—	8500	A	4	A	14	—	—	—	—	6	N	—	S	—	Fl,Fg	Adv[12]	41,000[14]	240	96	93
W-62	—[1]	6500	.80	—[12]	—	6000	A	1	—	—	A	2	A	11	6	N	—	—	—	Fl,Fg	Adv[12]	78,000[14]	297	86	114
W-62R	—[1]	6000	.49	—[12]	—	6000	A	1	—	—	A	2	A	11	6	N	—	S	—	Fl,Fg	Adv[12]	78,000[14]	297	86	114
W-62B	—[5]	1375[5]	—[8]	—[12]	—	6200	A	2	A	11	—	—	—	—	6	N	—	—	—	Fl,Fg	Adv[12]	65,000[14]	280	86	91
W-72	—[1]	8500	.69	—[12]	—	5000	A	2	—	—	A	2	A	12	6	N	—	—	—	Fl,Fg	Adv[12]	80,000[14]	307	86	114
W-72R	—[1]	7500	.48	—[12]	—	5000	A	2	—	—	A	2	A	12	6	N	—	S	—	Fl,Fg	Adv[12]	80,000[14]	307	86	114
W-91	—[1]	9500	.60	—[12]	—	5740	A	5	A	16	—	—	—	—	6	N	—	—	—	Fl,Fg	Adv[12]	80,000[14]	324	108	125
W-91R	—[1]	8500	.48	—[12]	—	5740	A	5	A	16	—	—	—	—	6	N	—	S	—	Fl,Fg	Adv[12]	80,000[14]	324	108	125
W-92	—[1]	9500	.61	—[12]	—	5000	A	2	—	—	A	3	A	16	6	N	—	—	—	Fl,Fg	Adv[12]	95,000[14]	365	90	114
W-92R	—[1]	8500	.49	—[12]	—	5000	A	2	—	—	A	3	A	16	6	N	—	S	—	Fl,Fg	Adv[12]	95,000[14]	365	90	114
W-101	—[1]	10,000	.59	—[12]	—	6000	A	5	A	16	—	—	—	—	6	N	—	—	—	Fl,Fg	Adv[12]	80,000[14]	324	108	125
W-101R	—[1]	9000	.49	—[12]	—	6000	A	5	A	16	—	—	—	—	6	N	—	S	—	Fl,Fg	Adv[12]	80,000[14]	324	108	125
W-101B	—[5]	1775[5]	—[9]	—[12]	—	6000	A	3	A	16	—	—	—	—	6	N	—	—	—	Fl,Fg	Adv[12]	77,800[14]	305	106	142
W-171	—[1]	17,000	.57	—[12]	—	4690	A	5	A	14	—	—	—	—	6	N	—	—	—	Fl,Fg	Adv[12]	143,000[14]	413	126	159
W-171R	—[1]	15,000	.46	—[12]	—	4690	A	5	A	14	—	—	—	—	6	N	—	S	—	Fl,Fg	Adv[12]	143,000[14]	413	126	159
W-301	—[1]	30,000	.58	—[12]	—	3600	A	4	A	15	—	—	—	—	12	N	—	—	—	Fl,Fg	Adv[12]	266,500[14]	531	174	180
W-301R	—[1]	26,500	.47	—[12]	—	3600	A	4	A	15	—	—	—	—	12	N	—	S	—	Fl,Fg	Adv[12]	266,500[14]	531	174	180
W-201E	—[5]	2420[7]	—[10]	—[12]	—	3600	A	4	A	15	—	—	—	—	1	N	—	—	—	Fl,Fg	Adv[12]	292,500[14]	629	192	264
W-201RE	—[5]	2250[7]	—[11]	—[12]	—	3600	A	4	A	15	—	—	—	—	1	N	—	S	—	Fl,Fg	Adv[12]	292,500[14]	629	192	264

Footnotes: [1]-AC,E,G,GC,M,O,W; [2]-AS,GG,Pr; [3]-AC,AS,BF,E,G,GC,Pr; [4]-This rating and all below are at 80°F amb; [5]-CFS at 11 psig; [6]-CFS at 14.4 psig; [7]-CFS at 35 psig; [8]-5700 lb/hr; [9]-6450 lb/hr; [10]-9230 lb/hr; [11]-8550 lb/hr; [12]-"In compliance with NEMA Standards" (capable of operating at least 25% above rated power when compressor inlet is 25° or below and barometer at 14.17 psia); [14]-Fuel "may require treatment" if heavy grade; [14]-a

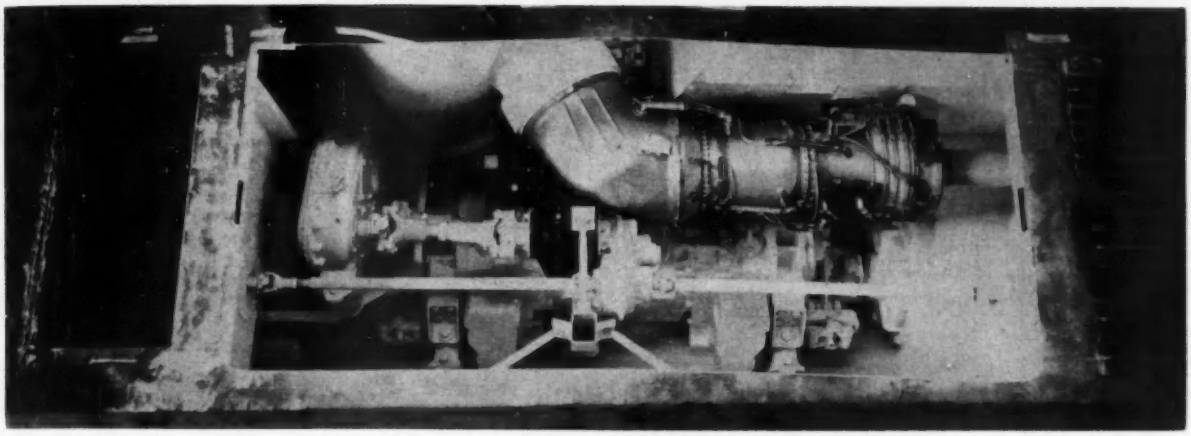
Williams Research Corporation, Walled Lake, Michigan

MODEL NO.	USE	RATING NORMAL hp	SFC	RATING MAXIMUM hp	SFC	POWER SHAFT: TURBINE RPM	TURBINE Type	TURBINE Stages	COMP. Type	COMP. Stages	COMP. SHAFT: TURB. Type	TURB. Stages	COMP. Type	COMP. Stages	No. Comb.	Re Heat	HEAT EXC. USED: At Comp.	Ex. Heat	OTHER	FUEL: TYPE	Treating	DRY WEIGHT lb	DIMENSIONS IN INCHES: L	W	H
WR2-1	Aj	70[2]	NP	70[2]	—	—	—	—	—	—	A	1	C	1	1	N	—	—	—	AK	N	25[4]	15	10	10
WR-8	SP,Au	75	NP	—	—	—	A	1	—	—	A	1	C	1	1	N	—	—	—	Fl	N	35[4]	10	10	15
Waukesha	SP[1]	400[3]	NP	600[3]	—	25,270	A	1	—	—	A	1	C	1	1	N	—	—	—	Fl	N	620[4]	50	28	32

Footnotes: [1]-I,M,Au,O; [2]-lbt; [3]-at 100°F amb; [4]-a

Specifications now available in reprint form

$1.00—Single copy . . . ask for quantity rates



Top view of turbine and transmission compartment of LVTPX-10 Amphib.

Jered-Turbine Team-Up in "Amphib"

Turbine-transmission "package" tops previous performance after recent Marine Corps conversion . . . capacity up, ton-mile efficiency improved!

Marine Corps hauled the gasoline engine and driveline out of one of their LVTP-5 amphibious vehicles and dropped in a new power system developed by Jered Industries, Inc. Hazel Peak, Mich. It consists of a General Electric gas turbine, Model 720 (T58) and Jered transmission system.

Jered Industries developed a highly-efficient power-shift (bands) transmission that allows GE's turbine power to be utilized effectively. Result was improved fuel consumption (tons-miles-per-gallon) for the new rebuilt amphib—the LVTPX-10.

Marine Corps reports they have given the production go-ahead for their LVTPX-10. Bureau of Ships, working at Jered Industries, expects that the new turbine-powered amphibious vehicles will be in service by early '61.

First let's look down into the power system compartment (see photo). Here we find—

1. Compressor, with controls of variable stator blades shown, top right.

2. Annular combustor, center of gas turbine.

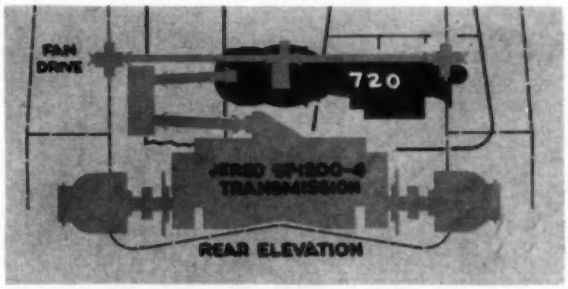
3. Two-stage compressor turbine and single-stage power turbine, at left.

4. Exhaust duct away from turbine (elbow).

5. Shaft out of duct into single reduction gear, black box, center.

6. Out of black gear box to left is 6000-rpm power shaft and out of black gear box to right is gear box (white) to shafts driving ventilating fans.

7. At left is 1:1 transfer case. Note that below top shaft is a shaft out of transfer case delivering power to center of large main gear box below turbine. This main gear box is the Jered ST-1200-4 unit. Arrangement is also shown in the schematic diagram.



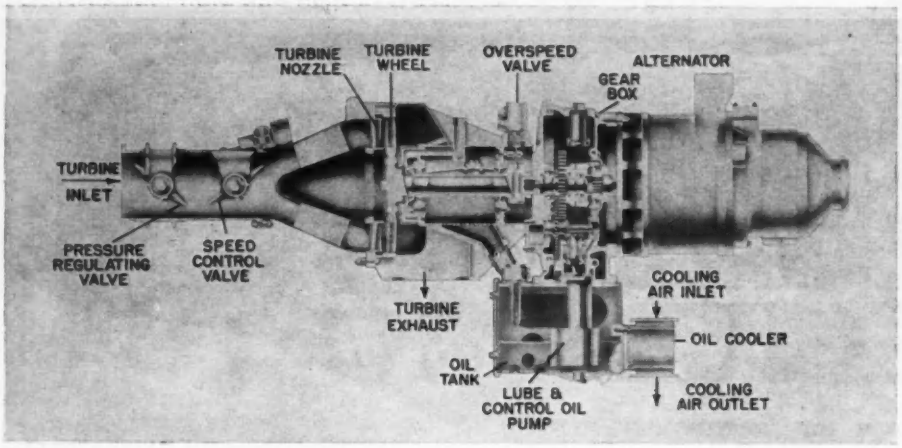
Schematic diagram of LVTPX-10's turbine and transmission

8. There is a final drive, 9:1 reduction, on both sides to drive the tracks. The one on the left side is clearly shown with the coupling joining it to the main transmission.

In the schematic view, note particularly that power is delivered to the center of the transmission so that the transmission is identical on each side of the center. Steering is accomplished by clutching in the planetary steering gear on either side of the transmission, obtaining power step-up for high speed maneuvering . . . or by using "clutch-brake" operation for slow speed and pivot maneuvering. It will be noted that airplane-spot-type brakes are arranged outside of the transmission.

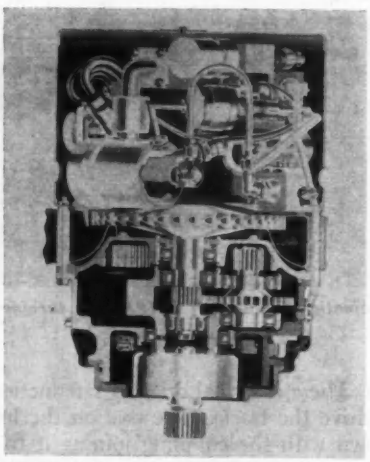
On each side of the center of the LVTPX-10 transmission, there is an extra "low" which is the steering planetary ratio. Effect on tractive effort is noted in the LVTP tractive effort comparison. Then there is the 1st, 2nd, 3rd and 4th or high ratio. Drive is mechanical without any hydraulic power transmission devices. The LVTP-5 uses a hydraulic torque converter. Due to efficiency losses in the converter, tractive effort curves of the LVTP-5 are much lower. However, for this type of heavy vehicle some form of torque converter is required. In the LVTPX-10 the hydraulic torque converter has been taken out of the transmission—*the tur-*

(Continued on Page 31)



Four of these AD-10 "Turbo-Alternator Drive" units operate in parallel in the B-52.

Picture Report: Let's look at GE's TURBINE



AS-18 "Fuel-Air Turbostarter" with combustor, lower left, and controls to mix and burn compressed air and fuel

There's an extreme variation in the gas turbine auxiliary devices built by General Electric at their Lynn, Mass. plant. We've included only a partial list built by the Aircraft Accessory Turbine Department. You'll note many are only for flight applications—yet some definitely are not.

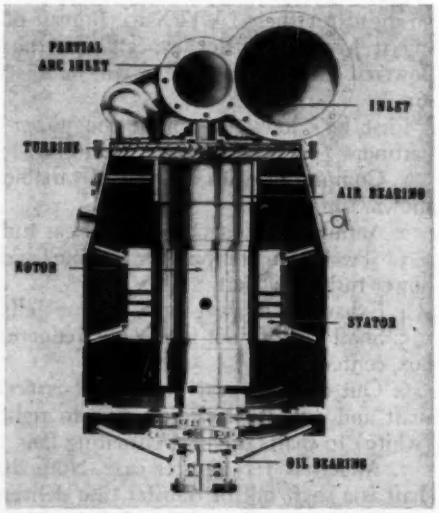
For example, a self-contained starter used on aircraft engines has "gone to sea" to provide quick-starting capability for a turbine-driven shipboard emergency electrical power supply system. GE's Model AS-18 turbostarter will be used to start a 600-hp Solar Aircraft Company gas turbine. These "Jupiter" T-520J engines will be driving shipboard generator sets slated for use aboard minesweepers by both the United States and the Federal Republic of Germany.

GE Aircraft Accessory Turbine Department Products

Model No.	Use	Rating	Turbine: Driving Source	Turbine: Inlet Pres. psia	Turbine: Inlet °F	Turbine: RPM	Turbine: Type	Turbine: Stages	Weight lb	Dimensions inch: L	W	H
AD-10	B-52	60KVA, 400cps	Bl Air	7-220	750	20,250	A	1	220[4]	39	19	23
XE-10[1]	B-52	40KVA, 400cps	Bl/Rm Air	7-220	815	24,000	A	1	120[3]	21	11	11
AF-10	Rocket	700 hp	H_2O_2	515	1350	-	A	1	130	16	16	22
AF-11	J93-3	140gpm, 950psi	Bl Air	170	1200	25,000	A	2	20	8	8	8
AM-10	X-15	4KVA, 15gpm[7]	H_2O_2 or S	340	1400	51,200	A	1	46	9	11	16
AM-31	Space	10-40 hp	H_2O_2	340	1350	-	A	1	40	12	12	11
AM-32	Space	25 hp	H_2O_2	340	1350	-	A	1	30	12	12	11
AP-10	B-52	9gpm[7]	Bl Air	9-220	750	37,500	R	1	90[4]	35	14	13
AP-11	F-86D	86gpm, 550psi	Bl Air	7-130	600	-	A	2	32	20	8	14
AP-15[1]	B-52	9gpm[7]	Bl Air	11-300	750	25,000	A	1	35[5]	23	14	13
AS-12	B-57	365[6]	S	1215	2100	45,000	A	1	60	21	9	9
AS-18N	KC-135	485[6]	Fuel-Air	440	2200	-	A	1	52	17	9	9
AS-18S	F-101B	485[6]	Fuel-Air	440	2200	-	A	1	52	14	9	9
AS-18T	T-520J	485[6]	Fuel-Air	440	2200	-	A	1	52	14	9	9
AS-33[1]	B52 (etc.	500[6]	Gr Air, S	1215	1800	-	-	-	58	15	9	9
AW-10[1]	Nuclear	500hp	Bl/Gr Air	80	700	-	A	2	150[6]	30	18	18

1 - Development units, others on production; 2 - Excluding alternator; 3 - Including generator and controls; 4 - Incl. reservoir, cooling system and controls; 5 - Low weight as operates on demand; 6 - Incl. accessories; 7 - at 3,000 psi; 8 - lb-ft, Torque.

Bl - Bleed Air Rm - Ram Air S - Solid Propellant Gr - Ground Air Supply



AE-10 "Turbonator" has generator mounted on same shaft as turbine, eliminates gearing. There's an air bearing also.

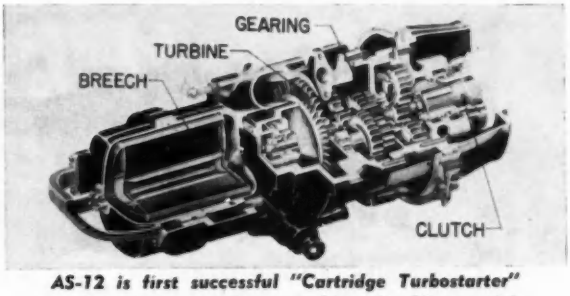
Here's a brief rundown of approximate production figures at GE's Lynn plant:

Air Turbine Constant speed drives including AD-10	over 2200
Air Turbine hydraulic pumps including AP-10 and 15	over 7300
Fuel turbopumps including AP-11 and AF-12	over 1200
Cartridge Turbostarters including AS-12	over 2300
Fuel-Air Turbostarters including AS-18	over 2300
Total Production Listed in Table	over 15,300

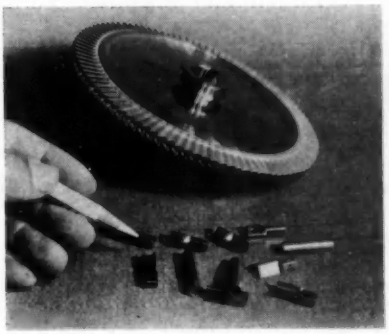
ACCESSORY LINEUP:

To this we could, of course, add about 200,000 piston-engine turbochargers although these are no longer built by GE. Adding these turbos to the many miscellaneous turbine drives (like the turboactuator and small APU's, etc.), brings the production figure close to a quarter of a million units to date! This does not include the 33,000 gas turbine aircraft engines produced by GE at Lynn and Evendale to say nothing about the large commercial gas turbines built at Schenectady.

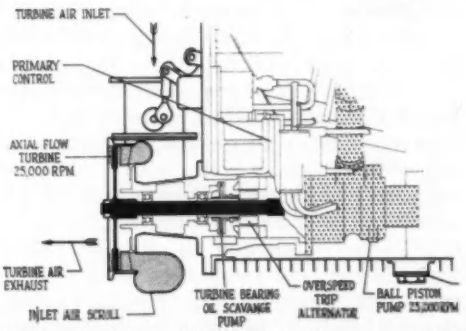
With this vast array of power packages, (plus many more not mentioned) you can readily see that General Electric is in a good position to make just about any combination of auxiliary power units or systems—for space, aircraft . . . for nearly any use on or under the surface of the earth.



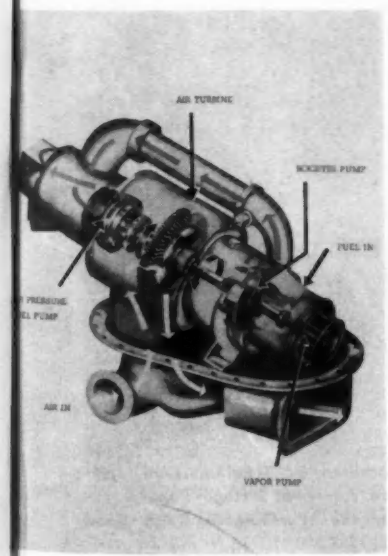
AS-12 is first successful "Cartridge Turbostarter" used to start aircraft gas turbines (in 10 seconds).



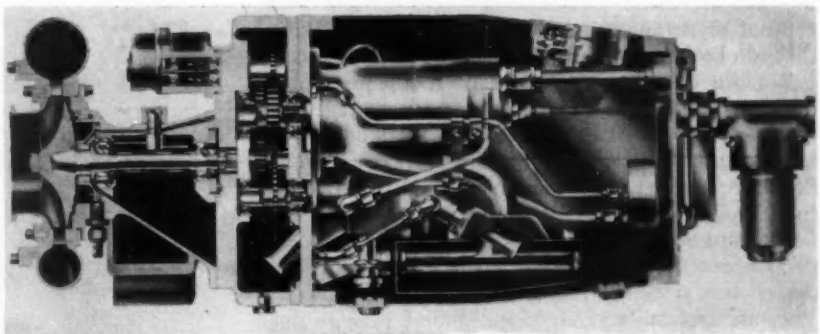
AF-12 afterburner "Fuel Turbopump". Unique, lightweight turbine buckets fabricated from metal tubing are used on drive's turbine wheels — first practical application of sheet metal buckets. It's in GE's J93-3 for the B-70 bomber.



AP-15, partial view. "Hydraulic Turbopump" weight is half that of AP-10. Designed for on-demand service.



AP-11 Tank-mounted afterburner "Fuel Turbopump." Split-type axial turbine makes for unique and compact design.



AP-10 "Hydraulic Turbopump" is companion to AD-10 drive on B-52. Pump is of the piston-variable displacement type, operating at 3700 rpm . . . supplies hydraulic oil to aircraft's hydraulic system.

(Continued on page 41)

Company Close-up:

Schellens-True

Turbine Blade Specialists

Tucked away in the Connecticut hills near Ivoryton is a small 40-employee company, Schellens-True Corp. It is a real specialist in its field, its principal business being precision metal working. Many high-quality machine shops rate as being "precision" metal workers but it is doubted if many could meet the complex requirements of this particular specialty—making unusually fine turbine blades and wheels.

These parts include not only constant-section blades and wheels but also airfoil-section types. They make integrally-bladed wheels and tapered and twisted airfoil blades of the type used in small gas turbines for aircraft, marine, industrial, automotive and missile use.

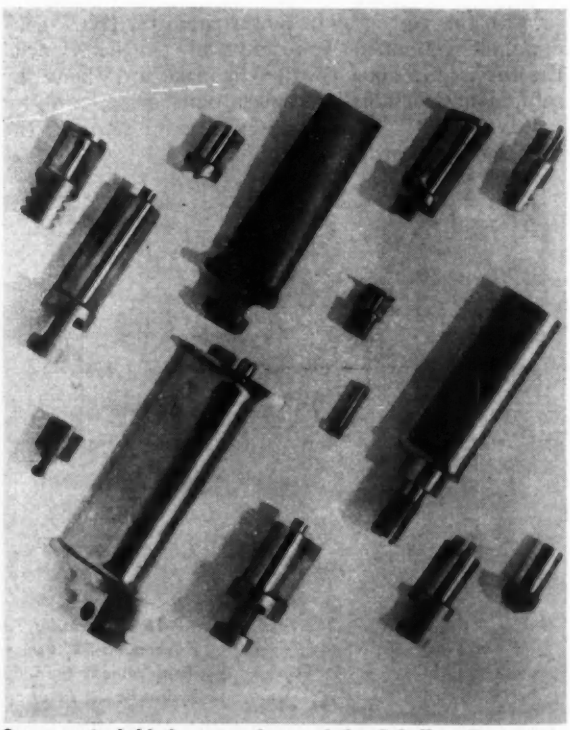
High-speed milling, turning and machining operations produce these parts accurately from bar stock, contour forgings and discs. Mostly, these parts and assemblies are made to customer specification and the concept of manufacture plus the tooling is such that they can be furnished in quantities of 100 to 100,000.

Rotating elements represent a major cost item in turbines and compressors. Accuracy is essential, after which cost, considering the quantities required, is a big consideration. Apparently, Schellens-True with their flexibility and versatility has met this demand for accurate, low-cost parts and components.

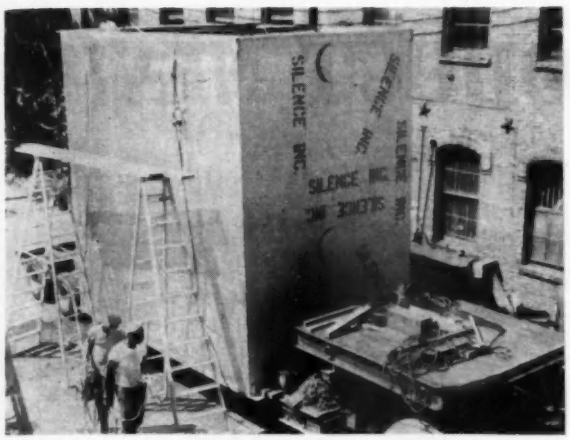
Standard Series or customer-designed blades made by them are used on wheels from 26-in. diameter down to the smallest sizes, running at speeds up to 45,000 rpm. They are applicable to single and double velocity stage wheels and the high-pressure stages of multi-stage units.

Products are used in steam, air and gas turbines, jet engines, blowers and pumps. You'll find turbines using these blades and wheels in naval and commercial marine installations, public utility and industrial power plants, military and commercial aircraft, oil field and refinery operations, in refrigeration and various special applications.

Schellens-True's type of specialization apparently pays off. In 1959 they had 14 customers whose orders ranged all the way from $219,000 to $460. These customers included many of the leading manufacturers of gas turbines for both industrial and missile application.



Some typical blades manufactured by Schellens-True. (pictured top of page) One-piece rotor—a 2-stage impulse expander shaft and blades for the Worthington Corp. Good example of machining done by S-T.



All's Quiet In City of Brotherly Love

Philadelphia Electric's gas turbine peaking plant works quietly in residential area.

Philadelphia Electric Company recently installed a 20,500-kw GE gas turbine to take care of city peaking power requirements. But PEC's plant is located smack inside a thickly settled residential area—so an effective silencer was needed to keep peace in the neighborhood.

Philadelphia Electric turned to Silence Inc. . . . and Silence Inc. engineers came up with a 25,000-lb silencer that is 10-ft wide by 15-ft long by 15-ft high.

Silence's unit is mounted on a vertical stack that discharges upward. Approximate pressure inside silencer is 14.7 psia, allowing an entrance and exit loss of 1.75-in. of water at an airflow of 283-lb/sec at 950°F.

Normally, gas turbine exhaust temperatures seldom exceed 750°F, with only a few broad temperature cycles per year. However, in this particular installation for peak-load operation there may be one or two start-ups each day which means 10,000 to 15,000 temperature cycles over a 20-year period. And, here, temperature fluctuation is from 1000°F to ambient. Silence Inc. had to design their silencer to withstand these tough operating conditions.

They decided on a shell that is ¼-in. hot-rolled steel. And for acoustical material they selected Owens Corning TWF-Fiberglas. To contain this acoustic fill—and provide an air-flow path for the exhaust gases—⅛-in. hot-rolled perforated steel was picked. Perforations are ⅛-in. dia, spaced on staggered centers to give between 22% and 26% open area. Continuous-arc welding was used throughout the unit, eliminating nuts and bolts and other items which might possibly loosen with expansion.

Result is that all's quiet in the "City of Brotherly Love"—specifically the neighborhood surrounding Philadelphia Electric's power plant. It's just another example of the growing fact that gas turbines, properly installed, *do* make good neighbors.

JERED-TURBINE TEAM-UP . . .

(Continued from page 27)

bine is a torque converter—reason for Jered's efficient transmission!

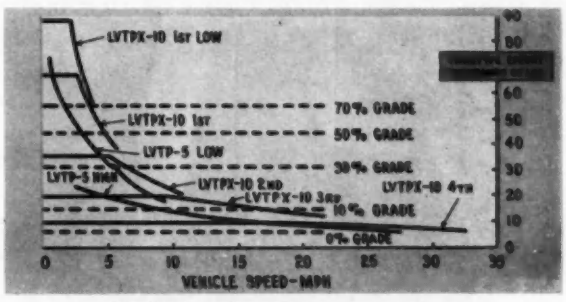
Transmissions are becoming an important part of today's gas turbine installations—they're going a long way toward helping utilize the full potential of the turbine's tremendous power, helping make the gas turbine competitive with other types of prime movers.

34 Marines vs 46 . . .

Not only has the ton-mile efficiency for the marine vehicle been improved by 40%, but also, reduced space required by the new power plant and transmission allowed the compartment bulkhead to be moved 5-ft aft, thereby enlarging the cargo volume by 210 cu ft. The LVTP-5 transported 34 men or 18,000 lb of cargo—the new LVTPX-10 will handle 46 men or 26,780 lb of cargo!

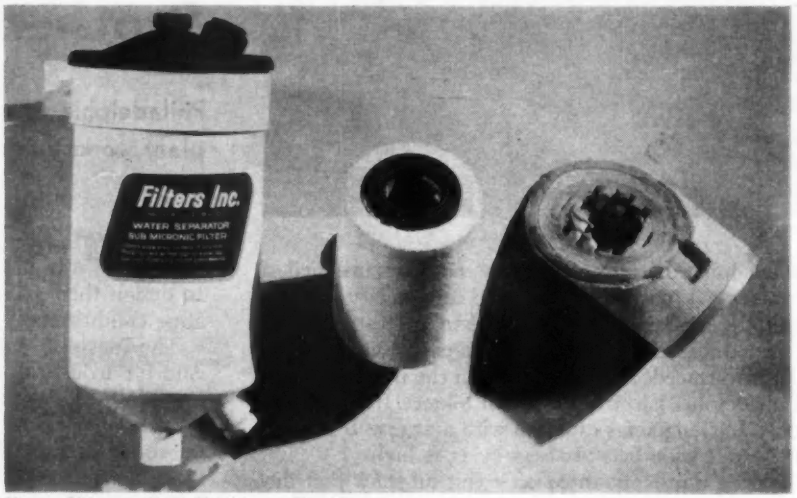
There appears to be many advantages of the gas turbine-powered amphib—increased carrying capacity, improved fuel consumption on a ton-mile basis as well as high performance. Acceleration is usually good. Reports are that GE's turbine accelerates from idling to full load in three seconds—faster than many smaller turbines now used on heavy-duty transmissions.

Department of Defense is becoming increasingly interested in the possibilities of gas turbines for their various vehicles. We'll probably be seeing many more experimental conversions in the near future. And a good deal of their success will depend on the effectiveness of the power transmission devices used.



LVTP Tractive effort comparison.

GT PRODUCT NEWS



Keep Water Out Of Your Turbine . . .

Filters, Inc. jet fuel water separators are designed to prolong your turbine's life by helping prevent water-caused damage. Fiberglass element is claimed to separate even the most finely emulsified water droplets from your fuel by "coalescence." (Attraction between fiberglass and water causes droplets to agglomerate into globules that settle into sump.) Also reported to provide exceedingly fine filtration of contaminants as well as water. Rated flow is 1-gpm maximum . . . may be mounted in parallel for higher flow rates. Dimensions are 5-in. dia by 11-in. height. Developed by Filters, Inc. for USAF, Navy and airlines . . . elements normally need changing only every 18 months.

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Use your GT Reader Service Card.

Boeing Tests Turbo-Prop Engine . . .

New propeller test stand is used by Boeing's Industrial Products Division to carry out FAA certification tests on their new 325-shp 502-10W turbo-prop. It's a 325-lb engine with 2600-rpm propeller shaft speed . . . normal continuous rating is 270 hp. Like all Boeing engines, turbine is free-shaft powerplant with single-stage components.

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MORE NEW PRODUCTS FOLLOW ►

On Guard! Against Vibrations!

Stewart-Warner's latest device from the Industrial Balancer Department not only stands guard on your turbine ready to shut it down when it exceeds safe limits of vibration amplitude, but, with an accessory plug-in attachment, becomes a portable balancer to be used to correct the condition.

Some of the applications for which the new vibration monitor is being used include protection of gas turbine engines at remote locations. In most cases the unbalanced, vibrating part can be corrected in place and at once!

Boasting greater versatility yet, the device features a "tuneable" pick-up, filtering out extraneous vibrations through mechanical resonance, excluding all vibration frequencies except that for which it has been pre-set. There's a "go, no-go" gauge for testing equipment with rotative parts having a vibration limit.

212

Grumman W2F-1 Makes First Flight

First flight of the prototype Grumman W2F-1 Hawkeye, a Navy turboprop early warning aircraft has been made. W2F is a high-wing aircraft with two Allison T56-A8 turboprop engines rated at 4050 eshp.

213

Navy Hydrofoil Ship

Hamilton Standard's Electronics Department has been awarded a contract to produce a dead reckoning navigation system for the Boeing Airplane Company's 110-ton, 3000-hp gas turbine hydrofoil craft for the US Navy.

214

Steel for Gas Turbines

At the Metal Show the Universal-Cyclops Corp. stressed the many types of steel they produce for gas turbines.

215

"Turbines Safer . . . More Reliable"

This is the heading of an SAE article, page 49, October 1960. It's a brief report of the findings of a panel consisting of principal air line and aircraft engine authorities.

216

Another Industrial P & WA Jet

The JT-12 pure jet is now operating in the Army, USAF and on executive planes.

The JFTD-12 is the JT-12 with power turbine added making a total weight of 870 lb. It will be used with the Sikorsky S-64 Skycrane helicopter. Testing at Sikorsky is now underway.

The FT-12 is the JT-12 with an industrial power turbine added. Prospective uses for this unit having a maximum rating of 3000 hp includes marine, driving pumps and compressors, power generation and propulsion of large ground vehicles, both military and earth-moving.

217

Delavan

Fuel Injectors

TOUGHER THAN TOUGH JOBS

■ Delavan specialists have broad experience in developing gas turbine fuel injectors that assure a high degree of reliability for long periods of time; that function consistently well under the most rugged conditions.

■ If you have a heavy-duty fuel injection problem consult us. Delavan engineers will develop a fuel injector that's tougher than the toughest job, hardier than the heaviest work. A Delavan injector may well reduce costs, save you valuable time or improve the performance of your equipment.

■ Delavan can bring a fund of developmental experience and manufacturing know-how that is unparalleled in the industry. Delavan is the world's largest manufacturer devoted to the design and manufacture of fuel injectors and spray nozzles.

■ *If an exacting fuel injector for gas turbines is needed . . . so is Delavan. For information write:*

DELAVAN Manufacturing Company

WEST DES MOINES, IOWA

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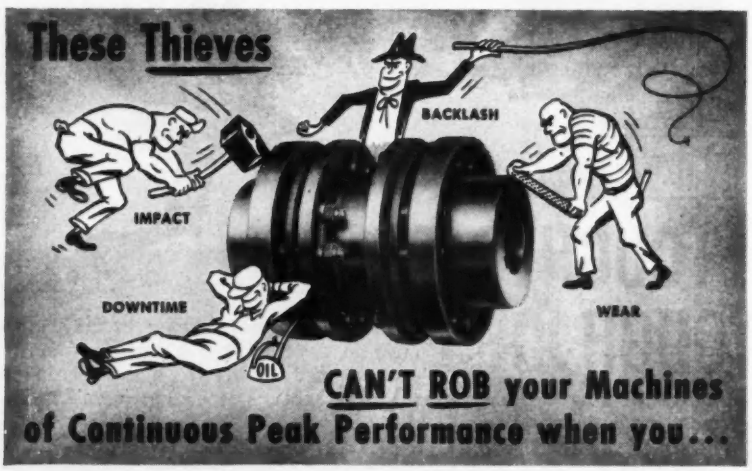
specialists in air filtration

Complete engineering facilities for research, design, development and manufacture of air filtration and sound supression systems for all gas turbine applications.

UNITED

UNITED SPECIALTIES DIVISION
Novo Industrial Corp.
9701 S. Cottage Grove Avenue • Chicago 28, Illinois

For more information write in No. 188



SPECIFY . . . THOMAS FLEXIBLE COUPLINGS

Think of the losses incurred by maintenance costs, lubrication, down time, damage to connected machines by inadequate flexible couplings.

High degree of accuracy, reliability and performance make Thomas Flexible Couplings the worlds best.

NO MAINTENANCE
NO LUBRICATION
NO WEARING PARTS
NO BACKLASH

THOMAS FLEXIBLE COUPLINGS

Write for Our New Engineering Catalog 60

THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PENNSYLVANIA, U.S.A.

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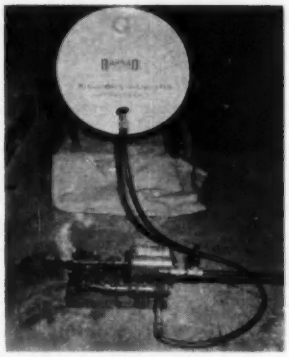
PRODUCT NEWS . . .



Variable stroke Milton Roy Pump used to supply Barsad additive from drum to fuel supply line of gas turbine.

Fuel Oil Treatment

The methods of feeding Barsad* additive to fuel oil is easily done by various means. Photo shows a simple method of pumping it into the fuel line. It is non-corrosive to gears—use of a variable stroke piston-type pump will permit a simple means of adjusting the dosage of the additive to maintain proper Mg/V ratio in the fuel.

An even simpler method of application of this liquid, oil-soluble additive, is possible by merely pouring the required amount of additive into the fuel fill pipe at the time of fueling. Another simple method of application, which has met with excellent success for years on a large number of motorships, permits a measured flow by gravity of the additive, into the discharge side of the fuel centrifuge. An interesting side-light in this connection, is that the Chief Engineers report the day tank is kept cleaner and free of any sludge as a result of the additive.

* R. S. Norris & Associates

218

All-New Marman Hose Clamp

Development of an entirely new clamp for hose or other general industrial applications has been completed and is now being marketed by MARMAN Division of Aeroquip Corporation. The MARMAN Hose Clamp has no perforations typical of many worm-drive type clamps. The steel screw engages on coined threads on the outside of band.

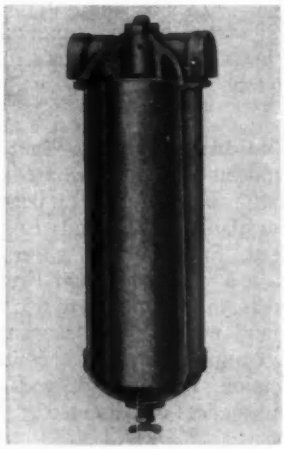
219

Ground Support Easily Transportable

Ground support for the Army's new Martin-built Pershing missile will be provided by The Garrett Corporation's AiResearch Manufacturing Division, Phoenix, Arizona, the world's largest producer of gas turbines under 1,000 hp. The Martin-Pershing support system marks the first Army adoption of the AiResearch dual power package concept already in use by many of the world's commercial jet lines. In a compact turbine-driven package the AiResearch Pershing unit provides all missile ground power requirements including air conditioning. Equipment driven from a 4-pad gear box provides AC, DC, and high pressure air, plus low pressure pneumatic power from the turbine's compressor section.

220

Use your GT Reader Service Card.



CFC's FULFLO Model SSB10

For Corrosive, Hi-Temp, Hi-Viscosity Fluids

Now available—a porous metal filter element of sintered 316 stainless steel for incorporation on any Commercial Filters Corp. fulflo filter. This is a recent and important addition to the complete line of CFC filters and other equipment. It's especially designed for corrosive, hi-temperature and hi-viscosity fluids. Shown here is FULFLO Model SSB10.

221

Solar APU's

Solar Aircraft Company is supplying two 30-kva Mars gas turbine units to be used in Project Mercury, the manned orbital flight program conducted by the National Aeronautics and Space Administration. The APU's were ordered by the Radio Division of The Bendix Corporation. They will be used to supply the power needed to check out the electronic equipment in the aircraft employed to test the ground communications and tracking systems.

222

Successful Oil Separator

A special design, high-capacity centrifugal separator developed for the US Navy for jet fuel purification has been released for commercial applications. Capable of separating sea water, solids and other sources of contamination from jet fuel and other products at a rate of 12,000 gallons per hour, the purifier is manufactured by De Laval Separator Company.

Success of the oil separator is due in part to the successful forging by Wyman-Gordon Company, Worcester, Mass., of the bowl shell coupling ring and bowl top for the uncommon stainless steel, Type 329, and the coupling nut and tubular shaft from Type 316 stainless. In development by De Laval for four years prior to Navy acceptance, the purifier is an adaptation of the De Laval basic disc-type centrifuge.

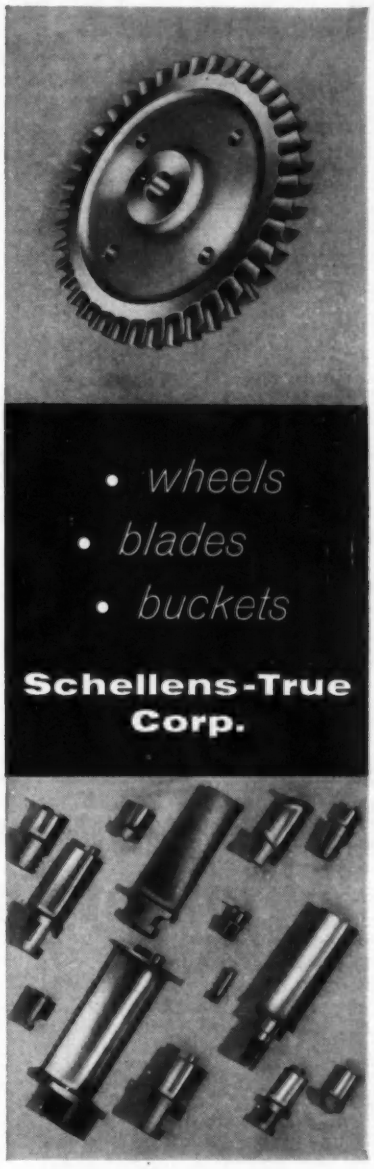
223

Use your GT Reader Service Card.

Battelle Shaft Seals

A major research program to provide a more basic understanding of factors involved in the design and use of high-speed rotary-shaft face seals has just begun at Battelle Memorial Institute. Program is being jointly sponsored by "more than a dozen large American manufacturing companies interested in advancing shaft-seal technology," according to C. M. Allen, specialist in bearings, seals, and lubrication technology at the Columbus, Ohio, research center.

224



The Schellens-True organization is devoted exclusively to the manufacture of turbine blades, wheels, vanes and nozzles of all types, machined from a wide variety of alloys and materials. We have developed entirely special automatic blade and wheel machining equipment available nowhere else. Creative engineering, precision manufacturing and rigid quality control assure a reliable product at a minimum cost.

May we quote on your requirements?

SCHELLENS-TRUE CORP.
Ivoryton Connecticut

For more information write in No. 190

GT PRODUCT TECHNICAL FILE

Clark Bros.
Illustrated Brochure

This new bulletin No. 186 describes the many advantages, such as simplicity, reliability, compactness and low first cost of their 9000-hp unit. Illustrations are unusually descriptive.

225

Variable Area Fuel Nozzle

This is just one of the items described in a 16 page brochure issued by LEE Company at Old Saybrook, Conn. These variable area nozzles, generally use Inconel X steel diaphragms with no sliding fits. Detailed sketches are also given. It truly illustrates "Fuel Injection Efficiency."

226

Use your GT Reader Service Card.

Vap-Air Valves
For Gas Turbines

New brochure put out by Vap-Air briefly describes the company and its products of electro-mechanical and electronic control devices, pneumatic equipment and valves, heat transfer equipment for aircraft, missiles and ground support equipment. Vap-Air is The Aeronautical Division of Vapor Heating Corp.

227

Rotating Shaft Seals

Name of a new brochure "by Cartriseal", extremely well illustrated and packed with specifications and diagrams, to say nothing of the appropriate cartoons on the 36 pages. This includes seals specifically made for gas turbines. Here's a brochure that you'll really enjoy thumbing through!

228

"Composite Compressor Rotors"

That's the name of a brochure recently issued by the Stalker Corp. This company is well known for making hollow blades formed "to as close tolerances as machined blades." These blades according to the brochure may be fitted into a sheet metal disc "about 55% lighter than the corresponding solid-blade, heavy rim rotor."

229

"Ponder the Whole—
But Get Specialists
For the Parts"

This is the title of a 4 page brochure that briefly describes the gas turbine work done by the Stainless Processing Div. of Wall Colmonoy Corp. "We have produced many notable brazing alloys. Our Standard Nicrobraz has become the industries workhorse. New methods in processing aluminum and titanium bearing super alloys have been developed in our research laboratory . . ."

230

Orenda Industrial Gas Turbines

Handsome, well illustrated, informative brochure of 24 pages is now available from Orenda Engines Limited. Specifications cover the OT-C-2, OT-F-2, and OT-F-3 turbines ranging from 6200 to 6700 hp, with and without heat exchangers. The component parts, controls, lubrication, maintenance and consulting services are discussed.

231

Viking Pumps

Two new catalogs are now available describing Viking positive displacement rotary pumps. One has 8 pages covering two sizes of pumps, the other has 36 pages in 3 parts. Part 1—"Rotary Pump Fundamentals," Part 2—"Selecting the Correct Viking Pump . . ." and Part 3—"Useful Engineering Information." Both are packed full of useful tables and data including lubricating and fuel oil charts.

232

(Continued on page 40)

Designed with Wall Colmonoy Stainless Brazing . . . A Case History:

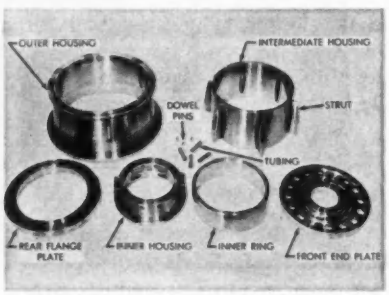
Brazing Speeds Building of Jet Engine Diffuser

The stringent design requirements of this diffuser assembly were met by stainless furnace brazing. The number of manufacturing operations were also reduced, cutting total cost.

The parts shown had to be joined for high performance service conditions. The Nicrobraz® stainless brazing filler metal used produced joints as strong as the parent metal.

Inaccessibility prevented machining after assembly, so allowable tolerance was only (plus or minus) .002". Precision application of brazing filler metal and of furnace temperatures kept distortion within the limits.

Call or write for more information about how our stainless brazing facilities can help you.



Wall Colmonoy Stainless Furnace Brazing Gave These Important Benefits:

- Brazed joints as strong as parent metal
- 13 parts joined in one brazing operation
- Distortion held to within ±0.002"
- No finish machining was needed
- Brazed assembly was fully annealed
- No clean-up, assembly was bright and clean

WALL COLMONOY CORPORATION
Stainless Processing Division
19345 JOHN R STREET • DETROIT 3, MICHIGAN

Representatives in all key industrial areas

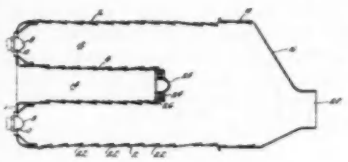
PROCESSING PLANTS: Detroit, Michigan • Morrisville, Pennsylvania • Dayton, Ohio • Montebello, California

For more information write in No. 191

GT PATENTS

By J. W. Sawyer

AERODYNAMIC FLAMEHOLDER (2,938,344) 15 CLAIMS Stanley J. Markowski, East Hartford, Conn., assignor to United Aircraft Corporation, East Hartford, Conn., a corporation of Delaware. Flameholder which will: permit gas passage without blockage; create only a small velocity gradient between initial point of burning and adjacent areas; not have metallic parts in contact with flame or hot gases of combustion; provide a stagnation point downstream at a predictable location which will provide a gas reverse flow region of controllable size downstream of the stagnation point.



COMBUSTION CHAMBER SWIRLER (2,951,339) 8 CLAIMS George R. Benson, East Hartford, Conn., assignor to United Aircraft Corporation, East Hartford, Conn. Features of the invention: swirler 24 on the inner sleeve 4 to impart a swirl to the air discharging to the burner space. Fuel nozzles 8 are positioned in openings 10 in cap 6 and fuel is discharged into annular space 12. Tip of dome 28 faces downstream direction to provide a faired surface for defining an inner wall for air flowing helically through vanes 24 and thus enter the space in a helical path.

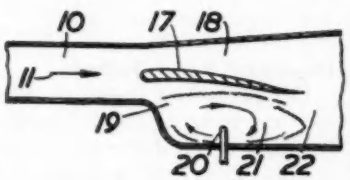
OSCILLATING FLOW COMBUSTION CHAMBER (2,930,195) 5 CLAIMS Arthur W. Blackman, Jr., Manchester, and Arthur E. Wetherbee, Jr., Newington, Conn., assignors to United Aircraft Corporation, East Hartford, Conn., a corporation of Delaware. Increased fluid mixing associated with oscillatory combustion flow increases the heat release rates in process of combustion reactions. Design provides means for complete combustion in shorter combustion chamber for given efficiency.

GAS TURBINE REGENERATOR DRIVE MECHANISM (2,953,901) 8 CLAIMS Richard Chute, Huntington Woods, Mich., assignor to Chrysler Corporation, Highland Park, Mich. A new and improved means for driving the rotary portions of a rotary regenerator mechanism for a gas turbine power plant.

FUEL SUPPLY AND FLAME STABILIZING APPARATUS FOR AFTERBURNERS FOR JET ENGINES (2,934,894) 8 CLAIMS Robert A. B. Lang, Lloydtown, Ontario, Canada, assignor to Orenda Engines Limited, Malton, Ontario, Canda.

FUEL FLOW CONTROLLER FOR GAS TURBINES AND JET PROPULSION UNITS (2,953,899) 17 CLAIMS Harold P. Sorenson, Minneapolis, Minn., assignor to Minneapolis-Honeywell Regulator Company, Minneapolis, Minn. Control apparatus controlling the fuel flow for a combustion engine which may be of the gas turbine or jet type.

ACCESSORY DRIVE (2,932,443) 10 CLAIMS Harry W. Gunberg, West Hartford, Conn., assignor to United Aircraft Corporation, East Hartford, Conn., a corporation of Delaware. An arrangement for driving an accessory gear from one rotor of a gas turbine power plant in which there are independent high and low-pressure rotors. This is accomplished without restricting thermal expansion or applying any axial thrust load to the rotor.

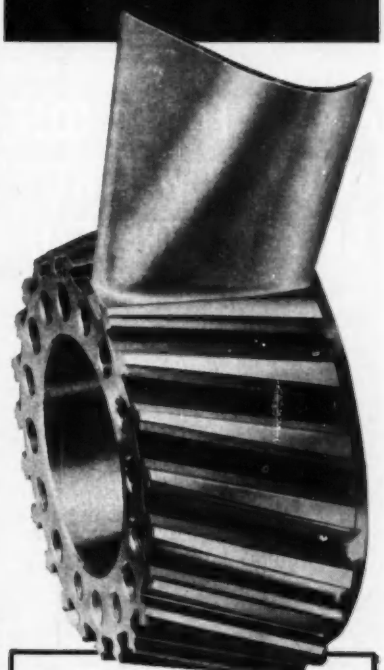


BAFFLE ARRANGEMENTS FOR COMBUSTION EQUIPMENT (2,947,143) 6 CLAIMS Dudley B. Spalding, Cambridge, England, assignor to National Research Development Corporation, London, England. Equipment for burning vaporizing fuel in a stream of combustion supporting gases in a duct which is shaped so that it has a greatly enlarged section with a flame-stabilizing baffle. Baffle plate 17 divides the gas stream into two parts. One continues through diffusing passage 18 and forms a dilution stream, the other part is deflected into an enlarged part of the duct at 19. In 19 there is recirculation of the combustion supporting gas due to the presence of baffle 17. Fuel is added to the recirculation zone through nozzle 20. There is an appreciable gain in static pressure through the diffuser 18 in this arrangement.

(Continued on page 40)

PRECISION Turbine Components

Creative engineering, experience and specialized production facilities at Poly Industries assure the highest degree of precision in manufacturing gas turbine components. Complete facilities for experimental or high production quantities of turbine blades, vanes, wheels and nozzles. Techniques for machining and forming with the toughest alloys of exotic metals are a specialty of Poly Industries.



Your inquiry is invited. Write for facilities brochure.

POLY INDUSTRIES

12177 Montague Street
Pacoima, California

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STALKER
ORTHOBRAZED
SHEET METAL
FABRICATIONS

Photo courtesy of Continental Aviation and Engineering Corp.

COMBINE LOWER COST, LIGHTER WEIGHT, GREATER STRENGTH

Stalker welcomes intricate, precision product manufacturing assignments involving forming and high-temperature brazing of stainless steel or super alloy sheet metal fabrications. Facilities include engineering, developing and production of strong, weight saving assemblies. Stalker also has facilities for heat treating, annealing and stress relieving, and U.S.A.F. approved quality control. Prototype and/or production orders. Call or write for specific information.

*Up to 48" in dia.

THE STALKER CORPORATION
905 Woodside
Essexville, Michigan
Phone: Bay City — TWinbrook 3-7562

For more information write in No. 193

Product-Technical File . .

(*Continued from page 36*)

Rover Gas Turbines

Six specification sheets have arrived from Rover covering their 60 and 90 hp turbines. These cover the following applications—turboprop, airborne auxiliary power plant, ground power unit, stand-by generating unit, marine and industrial, illustrating a wide range of applications.

233

Advanced Concept

Philadelphia Gear Corp., has a new brochure titled "Advanced Concept in Modern Gears." It is loaded with illustrations including a new precision gear hobber that will take gears 150 in. in dia. and 64 in. in face width. Gears for practically every use are shown including power and accessory drives for both small and large gas turbines.

234

New Flexible Metal Hose Catalog

Cobra Metal Hose has just announced the publication of a new catalog illustrating and describing an extensive selection of flexible metal connectors in Carbon Steel and Stainless Steel. Complete specifications including pressures, working temperatures, and installation methods are also included.

235

Important Filter Bulletin

Complete data sheets, describing over 225 items of 20 basic types of standard woven wire mesh element-in-line filters are available from Aircraft Porous Media, Inc., a subsidiary of PALL Corporation. In addition to the list of standard units, the literature describes options which make possible several hundreds of additional items. Each of the series of 20 data sheets shows a cross-sectional view of the filter element and housing. Working pressure, temperature ranges, port sizes and other significant factors are listed for each type shown.

236

GE's CF 700

This General Electric bulletin describes engine performance including 50% increase in range and 25% reduction in required runway space. Also explained is the reduction in noise and operating costs compared to turbojet engines.

237

Patents . . .

(*Continued from page 39*)

LIGHT WEIGHT AXIAL FLOW COMPRESSOR WHEELS (2,947,469) 11 CLAIMS Edward A. Stalker, Bay City, Mich., assignor to The Stalker Corporation. A wheel in which the centrifugal loads of the blades are carried into the hub plate leaving the rim substantially free of these loads.

COMBUSTION FUEL ATOMIZER (2,938,345) 6 CLAIMS Abe J. Perle, Verona, N. J., assignor to Bendix Aviation Corporation, Teterboro, N. J. Air-driven fuel atomizer provides finely atomized fuel spray and an intimate mixture of fuel with air for primary combustion.

ACCELERATION SCHEDULING AND ISOCHRONOUS GOVERNING FEED AND POWER CONTROL DEVICE FOR GAS TURBINE ENGINES (2,946,188) 26 CLAIMS James M. Eastman, South Bend, Ind., assignor to Bendix Aviation Corp., South Bend, Ind.

COMPOUND ENGINE (2,950,593) 9 CLAIMS Randolph Samuel Rae, Santa Monica, Calif., assignor to The Garrett Corporation, Los Angeles, Calif. A compound engine powered by a non-air breathing power source and by the combustion of atmosphere air taken into the engine.

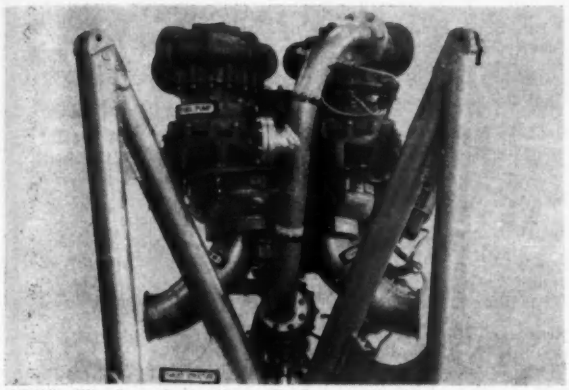
GAS TURBINE PLANTS (2,955,424) 8 CLAIMS Waldemar Hryniszak, Newcastle-Upon-Tyne, England, assignor to C. A. Parsons & Company Limited, Newcastle-Upon-Tyne, England. Gas turbine plants, especially those suitable for vehicle propulsion.

FUEL FEED AND POWER CONTROL SYSTEM FOR GAS TURBINE ENGINES (2,947,141) 23 CLAIMS Daniel G. Russ, South Bend, Ind., assignor to Bendix Aviation Corporation, South Bend, Ind. Fuel feed and power control system for gas turbine engines, turbojet and turboprop engines.

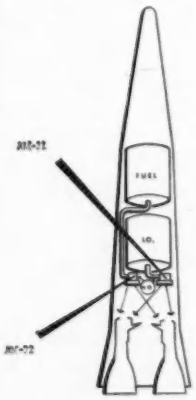
SUPERSONIC CENTRIPETAL COMPRESSOR (2,949,224) 25 CLAIMS Vladimir H. Pavlecka, Pacific Palisades, Calif., assignor to American Machine & Foundry Company. A novel centripetal compressor having a prerotation-stage and a plurality of contra-rotatable compressor stages being supersonic on the input side and subsonic on the output side.

GE's Accessory Lineup . . .

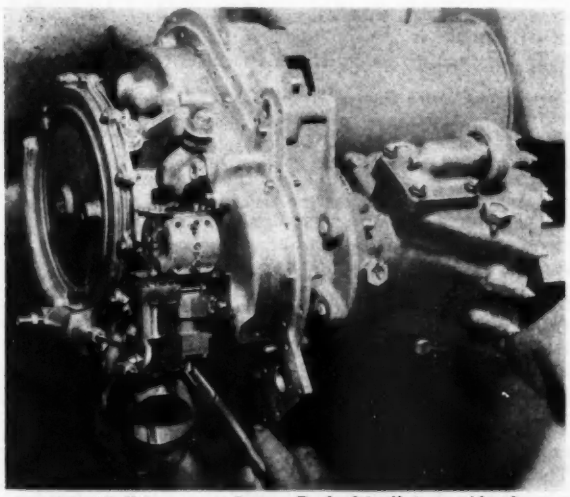
(Continued from page 29)



AF-10 "Fuel and Oxidizer Turbopump" drives two pumps which supply fuel and liquid oxygen to rocket engine.



AM-31 "Oxidizer Booster Pump Turbodrive" powers tank-mounted pump that raises liquid oxygen pressure to prevent cavitation in main pump of rocket engine. AM-32 "Fuel Booster Pump Turbodrive" is companion unit to AM-31.



AM-10 "Accessory Power Turbodrive" is on North American's X-15. Hot gases resulting from decomposition of monopropellant are directed against turbine through a partial-arc nozzlebox.

1960 CONSOLIDATED INDEX OF GAS TURBINE ARTICLES

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SYNCHRO-START

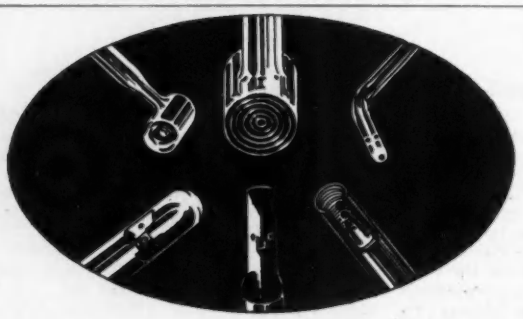
SPEED SENSITIVE SWITCHES

Various models containing 1, 2, 3, 4 or more switches are available with drives and mounts suited to the installation. Any drive or mounting shown can be used with any of our speed switches which are best suited for the job, whether it is underspeed, overspeed or varied numbered of trip switches.

SYNCHRO-START PRODUCTS, INC.

8151 N. RIDGEWAY AVE.
SKOKIE, ILLINOIS

For more information write in No. 195



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Technical Briefs . . .

Aircraft Engines of the World, the 1960/61 edition has been completely revised. Get your copy from Paul H. Wilkinson, 734 15th Street, N.W., Washington, D. C.

Design and Development History of the J79 Engine by F. L. Smith, Manager—Engineering, Commercial Engine Operation and N. Burgess, Manager, Commercial Engine Operation, Flight Propulsion Division, General Electric Company, Cincinnati, Ohio. (No. 240A SAE National Aeronautic Meeting, Los Angeles, Calif., October 10-14, 1960)

The J79 engine, the first of a family of high performance, light weight, variable stator engines, is a production model of afterburning turbojet engine capable of level flight speeds in excess of Mach 2.0 at and above 35,000 ft. Its sea level static maximum afterburner thrust varies from 15,000 lb to values significantly in excess of this in later, still security classified, models. History of GE turbines is given in Table 1 starting with the TG100A. Paper has unusually good details and includes 35 figures,

Development of the General Electric CJ-805-23 Turbofan Engine by W. R. Dodge, Manager of CJ-805 Engine Systems for General Electric's Large Jet Engine Department, Cincinnati, Ohio (the Air Transport Association 1960 Engineering and Maintenance Conference)

The paper describes in some detail, the configuration of the company's aft-fan engine, and testing program undertaken to ready it for airline service.

Development of a Pyrophoric Fuel Thrust Augmenter for the J69 Engine by D. G. Bay, Senior Project Engineer and J. H. Hill Head—Combustor Department. Continental Aviation and Engineering Corp., Detroit, Mich. (No. 240B, SAE National Aeronautic Meeting, Los Angeles, Calif., October 10-14, 1960).

The paper describes this simple, lightweight, very short, inexpensive afterburner using a pyrophoric fuel. A mixture of Triethylaluminum TEA) and Trimethylaluminum TMA) was selected to permit operation at combustion velocities considerably higher than those encountered in regular JP-4 afterburners. Safe methods of handling the fuel and purging the system have been developed and are explained in the paper,

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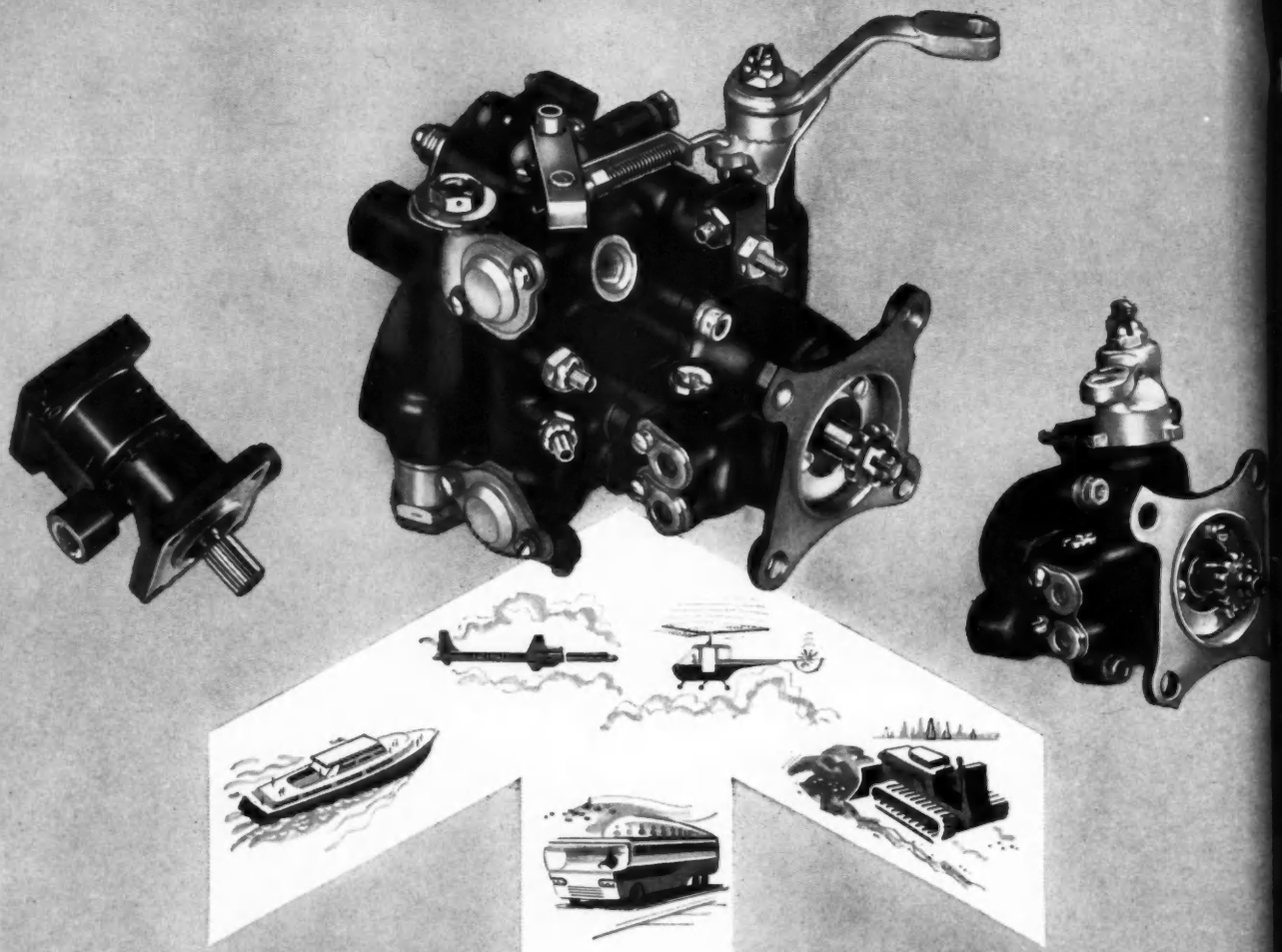

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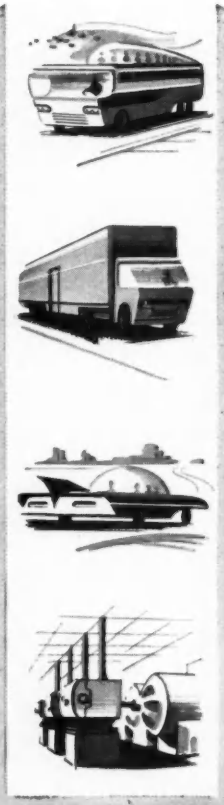

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